



REPUBLIQUE ALGERIENNE DEMOCRATIQUE ET POPULAIRE
Ministère de l'Enseignement Supérieur et de la Recherche Scientifique
Université Mohamed Khider – BISKRA

Faculté des Sciences Exactes, des Sciences de la Nature et de la Vie

Département d'informatique

N° d'ordre : GLSD05/M2/2021

Mémoire

Présenté pour obtenir le diplôme de master académique en

Informatique

Parcours : Génie logiciel et Systèmes Distribués(GLSD)

Parental Control Application for Schools

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Année universitaire 2020-2021

Abstract

The aim of this project is to reduce the spread of school absenteeism. In this project we are achieving for an application of parental controlling to children to check if they are attending the school. This project basically is useful for parents to check their kids's perseverance and to keep in touch with the school administration. The mechanism of this application is based on facial recognizer and compare software provided with a camera, and database contains children's file that has all the data needed for the program to work (the most needed is the child's images set). The system of surveillance camera not only identify who committed to school, but it can also identify the way the kids go, whether it's in or out of school and help to locate where he is in real-time. Facial recognition works by 3 functions: Detecting, capturing, and matching using a machine learning algorithm Dlib HOG mainly.

Keywords: Parental Control, Facial Recognition, Real time communication.

Resumé

L'objectif de ce projet est de réduire la propagation de l'absentéisme dans les écoles primaires. Dans ce projet, on réalise une application de contrôle parental aux enfants pour vérifier s'ils fréquentent l'école. Ce projet est essentiellement utile pour les parents de vérifier la persévérance de leurs enfants et de rester en contact avec l'administration de l'école. Le mécanisme de cette application est basé sur un logiciel de reconnaissance faciale et de comparaison fourni avec une camera surveillance, et la base de données contient les dossier des enfants contenant toutes les données nécessaires au fonctionnement du programme (le plus nécessaire est l'ensemble d'images de l'enfant).Le système de caméra de surveillance identifie non seulement qui s'est engagé à l'école, mais il peut également identifier la façon dont les enfants vont, que ce soit à l'école ou en dehors et aider à localiser où il se trouve en temps réel. La reconnaissance faciale fonctionne selon 3 fonctions : la détection, la capture et la correspondance à l'aide d'un algorithme d'apprentissage automatique HOG de Dlib.

Mots Clés: Contrôle parental, Reconnaissance faciale, Communication en temps réel .

Acknowledgements

I would first like to thank my dissertation supervisor Telli Abdelmoutia of the Computer Science faculty at Mohamed Khider University-BISKRA. The door to Prof. Telli office was always open whenever I ran into a trouble spot or had a question about my research or writing. He consistently allowed this paper to be my own work, but steered me in the right direction whenever he thought I needed it. I would also like to thank the experts who were involved in the validation survey for this research project. Without their passionate participation and input, the validation survey could not have been successfully conducted.

I would also like to thank my friends for accepting nothing less than excellence from me. Last but not the least, I would like to thank my family: my parents, my brothers, and my sister for supporting me spiritually throughout writing this thesis and my life in general.

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General Introduction

"Childhood is not from birth to a certain age and at a certain age. The child is grown, and puts away childish things. Childhood is the kingdom where nobody dies."

Edna St. Vincent Millay.

Background and Motivations

Parental controlling is associated with a variety of important outcomes for children and adolescents, such as delinquency, and school performance. Parental monitoring is not, however, a clearly defined, or unitary construct. Rather, it has been assessed in numerous ways, such as measures of parental knowledge and active parenting behaviors (e.g., parental solicitation of information, parental control of the child) [25].

Monitoring means establishing firm guidelines and limits for the child to keep track of what is going on in his or her social world. Monitoring also means establishing clear expectations about what your child should always tell you and that they can always talk to you about the things going on in their life [1].

Not only do school security cameras help you maintain safety around your campus, they also discourage misbehavior. Conspicuously placed school surveillance cameras have been shown to reduce threats of violence and vandalism drastically [2].

The camera plugged in the computer that has application setup functioning facial detection and recognition, and messages sending with covering all the states of the system. That's why installing robust security software of parental controls on devices can help parents to secure their kid's path to an appropriate environment which is school [3].

It's important for the parents to have the access to their child school schedule, parents activities in school, and the right to be notified by their child update. Some regions have law in their side like the law of Family Educational Rights and Privacy Act. FERPA requires schools receiving federal funding to preserve the confidentiality of a student education records and the personally identifiable information therein. FERPA also provides parents and eligible students the right to access education records. Images of students captured on surveillance recordings qualify as education records when photo or video is directly related to a pupil and maintained by the educational institution (or entity acting for the school) [4].

Problematic and Contributions

The problem that the parents facing especially when it come to the child's education and persistence is that It's hard to always keep tracking them. When it comes to absence, missing a day here or there may not seem like a problem. But, absences add up quickly. And, these missed school days can have a big impact on the child's learning and lead to chronic absenteeism ; it means missing too much school (for any reason) excused or unexcused. Experts, and a growing number of region define chronic absenteeism as missing 10 (or around 18 days) during a school year [5].

Dissertation Organization

Our dissertation consists, in addition to the introduction and the conclusion, three chapters. The first chapter is state of the art, while the tow last chapters are the contributions on smart parental control children. The dissertation is organized as follows: We present in the chapter 1 an introduction about parental control that describes definitions and concepts of important of parental control and its effects on childhood life.

In chapter 2, the evaluation and conception of the proposed system are presented The implementation, tests and results of our system has been presented in chapter 3.

Chapter 1

Parental Control and Monitoring

"When we are children we seldom think of the future. This innocence leaves us free to enjoy ourselves as few adults can. The day we fret about the future is the day we leave our childhood behind."

Patrick James Rothfuss.

1.1 Introduction

ABSENTEEISM is an issue for children as young as primary school grade up to middle school age, whose poor attendance can hurt academic performance and set a pattern for years to come [32].

To reduce the lack of absence of the child, the educators start using the help of applications and security cameras. Installed cameras ease the job of parental control in school. When parents know that the cameras are installed and streamed live to a video management system that can be monitored by a security person, their peace of mind is improved [6].

This chapter presents some essential guides of parental controlling with the risks of disregarding them, and the surveillance camera's help to build effective system for parental controlling, alongside with some related works with brief description to them.

1.2 Parental controlling importance

The parents are the link between the child and the outside world. Research says that monitoring child's activities is an important way to lower his or her chances of getting involved in situations the parents don't approve of, especially those that can be harmful. Not only does the parents involvement tell the child that he and his activities are worthwhile, it also makes them better able to see changes in their child that may indicate a problem. Monitoring who is in the child's life is especially critical to protecting them from harm because children today are around more adults on a daily basis than ever before. Parents should monitor their children for many reasons, however, the most important reason is to keep the child from being harmed by strangers ,and even by his own friends and their families, the child comes in contact with more adults today than ever before. Monitoring their interaction with people (as well as their own friends) is crucial to keep the child safe [1].

Parental controlling is an effective method of preventing the kids from engaging in a high risk behaviors, but this isn't just about parents monitoring and communication, this fact should send a message to any party that has tied relationship with the kid so that their relationships and communication with him can be very beneficial and positive on developing youth ,which means if the parents worked with the manners and the appropriate ways of controlling , that will create a great relationships between kids and parents ,that leads to effective communication. When the parents have a great relationship with their kids, they are more likely to listen and apply what they tell them including essentially avoiding addiction and making wiser decisions to avoid delinquency [27].

The parental variables that have received considerable research attention is parental monitoring which generally is subdivided into two categories: surveillance and knowledge gained from the child's self-disclosure of actions to parents. Both appear to have protective effects on children's delinquency, but knowledge is clearly the preferred modality, as it suggests a warm and accepting family context and environment in which the child feels free to disclose issues to parents. Early survey research by Ramirez et al. (2004) showed that youth (fourth through 12 graders) who perceived higher degrees of parental surveillance were less likely to use illicit substances [30].

Parents face a challenge which is weighing the conception of giving their children freedom and defining the boundaries of that freedom. Most parents understand that limiting children's access to the internet could affect their ability to learn and develop, but this also means exposing children to threats and environments that may go beyond their capacity to handle [3].

Parental monitoring is not an easy job, with responsibilities that seem to change every day. The daily tasks and roles you perform as a parent are bound to change as your child gets older, however, there is one task that is always important which is monitoring your child's contact with his or her surrounding world. Parents need to be aware of their children's activities and interactions through every age and stage of growth [1].

Applications can help the parents track their kid's locations. They help to indicate the kids are safe and where they're supposed to be and help the parents to find them in emergencies. Typically, the parents device will need to be turned on for any update about him and for the software to work, however, it's still a good idea to talk with your children about safety measures. Ask them to avoid interacting with stranger and keep it to the trusted people like educators , teacher..etc. In case strangers can access to where the kids are parents must be kept in touch [3].

1.2.1 Ways of parental monitoring

If the parents monitor their child's activities, he is much less likely to be delinquent . Studies have found that kids who are home alone two or more days per week are four times more likely to get substances addiction than those who had parental supervision five or more times a week. These steps will help the parents to provide adequate monitoring of their child's activities:

- Establishing relationships with the child's friends. Children are more likely to experiment addiction and delinquency if their friends do, and if they spend a lot of unsupervised time together. Knowing his friends can put you in a closer touch with the child's daily life. Also, when parental monitoring is high, kids are much less likely to choose friends who is delinquent.

- Getting to know other parents, and that's by arranging to attend school events or other gatherings with parents. The parents can reinforce both his and the child's efforts and provide a valuable support network.
- Asking lots of questions. If the child is going out, the parents have to make sure they know where he's going, who he'll be with and what he'll be doing. Asking for phone numbers and addresses of friends' houses and letting him know that they may call or drop by to check up on him will help, and being afraid to do that may create problems in early stages. When he first starts to visit friends' houses, then it will be habit rather than practice when he reaches his teens.
- Checking on the child at regular times. When he's at a friend's house, parents should check on in occasionally. It's essential to make sure that he has the parents phone number(s) and knows where they'll be and how to reach them.
- Making sure the child has access to enjoyable, safe, structured activities. Youth who are involved in constructive, supervised activities after school and on weekends are much less likely to be delinquent. Parents should encourage your child to get involved in activities such as soccer leagues, helping with school plays or volunteering at community organizations [7].
- Finding out where the child is going and with whom, and how he will get there and back home.
- Showing up early to pick the child up so that the parents can observe his or her behavior.
- Checking up on the child occasionally to see that he or she is where they said they would be.

However, the parents should deal with these ways and steps carefully ,because monitoring does not require the ability to be with the child every minute of every day. Being a careful monitor combines asking questions and paying attention with regard to making decisions, setting limits, and encouraging the child's positive choices when you are not there.

As the child gets older, monitoring may not seem as easy as it once was. The child may begin to discover his or her own personality, which might clash with yours. The drive for independence during adolescence years can make communicating with and monitoring your child even more difficult. As a result, it can be very difficult to communicate[1].

1.2.2 Practical tips

Here, we give some practical tips to get the child to school on time, every day:

1. Setting attendance goals with the child and tracking his attendance on a calendar and school schedule provided by the school. Trying to offer small rewards for not missing any school.
2. Helping the child to get a good night's sleep. A lack of sleep is associated with lower school achievement starting in middle school, as well as higher numbers of missed school and tardiness. Most younger children need 10-12 hours per night and adolescents (13-18 years of age) need 8-10 hours per night.
3. Preparing the night before to streamline the morning; like laying out the child's clothes, packing backpacks and lunches, developing back-up plans for getting to school if something comes up like a missed bus or an early meeting, have a family member, a neighbor, or another trusted adult on standby to take the child to school.
4. Talking with your child about the reasons why he or she does not want to go to school. School-related anxiety can lead to school avoidance. Parents needs to talk to their child about it , and try to get them to talk about any emotional struggles they may have with issues like bullying, fear of failure, or actual physical harm. If there are a mental health issues, parents should talk to the child's teacher, or school counselor.

However, the parents can collaborate with the school administration and the teachers using helpful methods like security software and surveillance camera system to check if the child following the orders and not avoiding school [5].

1.3 Places parents control

Parents should control their child in multiple regular places and events including the parks , trips .. etc, but there are some environments where parents needs to focus more in their controlling task as we cite:

1.3.1 Media and online

Parents allow their children and teens to have a cell phone, because it's a great way to stay in touch with them. It also gives parents a sense of where their children are and what they could be up to.

While the kids are learning to be good online citizens and make friends online, the parents can do their part by keeping tabs on their devices. Parental controls apps can help monitoring emails, social media profiles, texts, and other mobile functions.

The applications help when the parents are especially concerned about problematic conversations or activities. For example, some apps send notification when it detects certain words. It's best if the parents let the kids know when they're monitoring their devices, especially since they will need the kid's account information, including passwords for some of the features.

Also Parental controls can help back up data. Children sometimes use the internet to complete school projects and homework. It's very important to back up their data in a safe and reliable place. Teaching children the importance of saving and storing data is essential as well. Many free software programs are available online that offer storage services. But some of them could possibly be infected with malware and viruses.

Kids also have a collection of memories in the form of photos, texts, and emails that they want to save for the future. Phones may fall in water, they may break, get lost or stolen, or they simply stop functioning naturally, that's why making sure of protecting their digital memories with a secure backup is important [3].

1.3.2 School and outdoor

It's a parent's responsibility to check on their kid's progress in school, that means more than signed report cards every year. Fast-paced parents balance jobs, tasks, and a variety of other duties, but still, overseeing their child's schooling must be their top priority.

Parents always provide the best for their children, especially in education. That's why it's essential to keep track of children's educational progress to ensure that they're able to deal with life and well prepared to succeed.

Whether the child just entered school or is starting a new experience, to gain insight into the child's performance at school, don't wait for schools to release report papers. Most teachers use formative process tests to follow learning effectiveness on pupils. It includes analyzing how quickly learners can accomplish the tasks with no grades added to them [8].

That's why perseverance, and persistence in school attendance are essential roles for improving the child's learning ability which is a hard task for parents to get track. That's why Keeping in touch with the child's teacher and school administration is a method of parental control using an application, and surveillance camera security system plugged.

Absence, early leaving, coming late are major cases and causes of delinquency which can be addressed to parents by the school administration using messages and notifications.

The goal is to start the school year off engaging everyone in raising awareness about the importance of attending school and conveying the right message to the parents and pupils. Attendance messaging builds a habit and a culture of attendance by helping everyone understand why going to school regularly matters and what they can do to ensure pupils are in school [9].

1.4 Risks of disregarding children in school

Parental control is one of the tasks of the parental care. proceeded parental control in early age is viewed as one of the most important factors that help raising children, and improving their abilities [28].

A lot of researches about the effect parental care absence on the short-term in-school outcomes and long-term educational achievement of left-behind children. The results show that parental care absence is negatively associated with the development of left-behind children. Left-behind children have a lower cognitive test score and academic test score, and they are also less likely to attend a college. A Mechanism analyses show that parental control absence may result in a less healthy mental status of children and reduce children's efforts in class [29].

A researches have shown that the absence of parental control in the child's early age create undesirable outcomes in term of children's health development, behaviors in a daily bases, and inside school performance [34].

An estimation study rates the effect of parental control absence on students' school attitudes and acts, and finds that it's negatively affects school behavior of neglected students significantly, especially the class integration and personal behavior control [33].

Students with parental absence tend to have a lower self-assessment on their behavior and campus life, such as more likely to be late for school, less likely to receive praise from the head teacher [29].

Also the absence of parental control in school can cause chronic absenteeism. In fact, this problem starts early. At least 10% of kindergarten and first-grade students miss a month or more of the school year. Chronic absenteeism becomes more common in middle school, and about 19% of all high school students are chronically absent [5].

Beside of that, ignoring parental control tasks can lead the child to physical incidents, an unbalanced health, and causes of injuries.

1.5 Main focuses of parental control in school

In order to assure the child education control in school, the parents mainly focus on two factors: The child perseverance and communicating with the school administration.

1.5.1 Perseverance control

Attendance is a significant factor concerning student success. The more a pupil is absent, the increased chance he/she will fail their courses. Also, the administration should understand that pupils have their circumstances. This is where it needs the parents' help by following these steps in case of absence, lateness, or early leaving:

- Sending a letter, email or phone call to the school by 8 am explaining the reason for that day;
- Producing a doctor/physician note your child will be absent for three or more days in a row.

The administration has to make sure they are coding every absence correctly in their system to report it. As a district, they are being evaluated by several factors, and one is attendance. If the reports show them moving in a direction that reflects poor overall attendance as a district, they want to make sure all absences are justified, and pupil absentee records are current. In addition, they send out messages about the absences and following up with administration and our pupil services team to look at interventions to curb any attendance issues moving forward. The district has a host of resources they can use, and it will be important to work together with the parents as a team (home and school) to improve overall attendance. It is the responsibility of the parent and guardian to make sure their child is attending school daily, and the district is here to help with that. If the two parties do not get the cooperation and collaborative effort to make that happen, the losses go to the child so the school administration and teachers need the parents' help, as they work together to ensure that your child is in school and being successful [10].

1.5.2 School communication

1.5.2.1 In term of attendance to school

Chronic absenteeism, defined as missing more than 10 percent of school days in a year, is one of biggest barriers to school success.

Parents can be powerful allies in preventing the problem and creating solutions. New research supports that idea, finding that simple, low-cost strategies to target parental beliefs about attendance can reduce student absences and pave the way for academic success. Two recent studies on two different cities have explored whether sending messages about attendance to parents could affect their children's attendance.

One study, conducted by education policy researchers Carly D. Robinson and Monica G. Lee and psychologists Eric Dearing and Todd Rogers, looked at whether personalized mailings could reduce the absences specifically of young children with poor attendance. Hypothesizing that many parents do not fully comprehend the consequences of missing school, the researchers mailed home messages such as "attendance in early grades affects student learning" and "absences result in missed opportunities that cannot be replaced." Because parents tend to underestimate the number of school days their child has missed, the mailings also reported how many days that child had been absent.

Another larger-scale study, conducted by Rogers and policy analyst Avi Feller, sent similar mailings in to more than 28,000 households. These mailings, which either reminded parents of the importance of attendance, additionally stated the child's total absences, or further compared those absences to the child's classmates', went out to students in every grade and with any attendance record. The Effects : These low-cost, simple interventions had strong results.

In the first study, students whose families received the mailings missed 8 percent fewer school days than students in the control group (students receiving mailings were absent an average of 6.37 days, as opposed to 6.9 days).

Even more promising, the mailings were most effective for students with the lowest attendance. The mailings corresponded with a 15 percent reduction in chronic absenteeism, compared with the control group.

In the second study, over the course of the year, students whose parents received both reminders about the importance of attendance and information about the number of days they had missed were absent only 16 days on average, as opposed to 17 days on average in the control group.

school leaders look for ways to reduce chronic absenteeism, these studies provide some valuable insight.

The emphasis on elementary school absences is also key. Other attendance interventions haven't focused on young children, "despite the well-documented association between K-5 attendance and negative student outcomes," says Robinson, a doctoral student at the Harvard Graduate School of Education. By targeting chronic absenteeism from a young age, schools can set the standard that attendance is vital for success.

The studies further support the notion that any form of messaging with parents (backpack reminders, text messages, in-person dialogue) can help all families feel more connected to school and to their students' success [32].

So any other sort of notification can be helpful, especially if it is up to date with the technology, which is well developed software. Beside of that , parents are concern about where the child goes if the absence or late attendance occur , they will suspect the safety of the child (accident , addictions , bullying , getting lost , interact with strangers .. etc).

1.5.2.2 In term of education

The lack of coordination with the child's teacher is one of the primary problems that parents deal with in tracking their children's educational performance.

In caring for and educating the child, parents can never be more grateful to a teacher. The concern about the child's progress is unquestionably at the same levels as that of their teacher. Thus, as much as possible, communicate with the teachers (meet them at conferences by phone or email) inquire about how the kid is performing at school, the child's weak points, or what you could do to follow up at home.

Regardless of children's grade level, whether in or completing their last years in elementary, there are plenty of compelling reasons for parents volunteering at school. That move would be an effective way to show the kids the interest in their education.

Volunteering at school is a way for you to monitor your child. Similarly, your presence around motivates your child to do better. That is, of course, on top of helping the school in activities or other functions. Many graders like seeing their parents at school, especially during events [8].

here are some advantage of parental involvement:

- When there is good communication between parents and teachers, absenteeism decreases. According to a report by Johns Hopkins University (JHU), this helps reduce student absenteeism by 24 percent.
- Academic performance increases. According to JHU, aspects such as comprehension and reading fluency improve when there is parental involvement, even more so if parents spend time reading with their children. The students feel more motivated to learn, and their grades improve.
- It also helps improve student behavior in the classroom. Having parents and teachers communicate more helps students feel more motivated in their classes; their self-esteem and attitudes in class improve.
- The benefit extends to all ages. Although the benefits are usually discussed in the context of preschool or elementary school students, there are other studies focused on high school students. Parental involvement is something that makes a difference at all educational levels, although its influence decreases as the student progresses in age. Still, in high school, for example, having the parents involved can affect the decision of whether the student wants to continue studying or not.
- Parental involvement improves teacher performance. When parents have better communication with teachers, they learn to value the work and the challenges that teachers face, which makes the teachers feel appreciated. It also helps the teachers to get to know the student more, allowing them to teach in a more personalized and effective way.
- It helps when the parents feel happier and more involved with their children's education. A good connection with the school lets parents understand the curriculum better and the advancement of their children. [11].

1.6 Surveillance camera system in school

Surveillance security camera helps to control the pupil persistence to attend school constantly and early, unless, there are some circumstances stopping the child from attending school, or the parents from sending them.

This application's system is a sort of collaboration between the parents and the school administration/teachers to help protecting the kid's well-being, well behaving, safety, and education.

1.6.1 Camera surveillance system

Surveillance security camera also helps in other forms. Here is some roles that cameras may provide for a lot of schools:

Monitoring who is inside the school: With video surveillance, the administration will easily be able to keep an eye on who enters in real-time. Placing cameras can give a broad view.

Today's surveillance systems are more than just cameras. They also come with the option to use motion-sensor software. When pupil is in an area where they should not be, motion sensors will trigger a text or email alert notifying the parents and the school administration.

Keeping pupil Safe: The most important reason for choosing a video surveillance system for the school is to keep pupils safe. Surveillance systems help to monitor pupils, keep an eye on problematic situations. They can also be helpful in monitoring campus visitors and preventing unauthorized access to the campus.

Help to assess the situation: Video surveillance systems can help to assess the situation more accurately if a situation does occur. Better information leads to faster evacuations and more efficiently securing school grounds. Preventing access, reacting to problems, and improving the reaction time of the authorities adds up to safer schools and satisfying parent's validation.

Give the parents reassurance: Parents want to feel confident that their children are as safe as possible at school. That's when parents will start concerning about the children attendance and perseverance.

When adding video surveillance to the security system, the parents will have the

peace of mind that comes with knowing that the administration are providing the school with the kind of comprehensive security that makes all of these good things possible [12]. Security cameras provide reducing parents' fear of crime, deterring intruders, preventing misbehavior and unauthorized absences[13].

Providing live-feeds: School security cameras deliver a live-feed that can be streamed during times of crisis. The school security camera system can not only identify who attended school, but it can also identify what path the pupil went. It locates in real-time so that the administration and the parents can track them down and prevent damages from occurring. But it's important to make sure the school surveillance system software is optimized with real-time video as opposed to just archived video in order to maximize its effectiveness. Real-time video will stream footage as it's happening and provide situational awareness for the authorities while archived footage is delayed.

Preventing bullying and vandalism: School bullying and vandalism is also a major problem. By installing school security cameras, you can not only punish bullying or vandalism after it happens, but also leverage those cameras as a preventative measure to keep it from happening in the first place. School security cameras can be placed and capture activity that might be missed by the teacher. In order to do everything they can as school leaders to prevent bullying and vandalism, it's critical to equip the facilities with a reliable video surveillance system.

Providing evidences of misbehavior: In some cases, there are a lot of accusations toward the pupils of bad behaviors. In the cases where these are true, video camera systems capture those behaviors, and help to hold who did it accountable. But in cases where the allegations are not true, video camera systems also work to defend the pupil, and help maintain their good reputation. Parents will always be concerned with their children's well-being. In order for the administration to do everything they can to ensure the children are attending school in a safe environment, school security cameras must be installed. When parents know that these cameras are installed and streamed live to a video management system that can be monitored by security personnel, their peace of mind is improved[6].

Context: the security camera is plugged in the hardware in the administration that contain software to detect the presence of pupil, and notify the parents in their devices of the child attendance. The ways of dealing in that term is up to the parents to prevent that from happening again. Also the system protect the privacy, which mean not everyone can access to the footage, or any private data.

1.6.2 Software's services

The mechanism of this application is based on facial detector and capture by the camera, a compare/recognizer software, and database contains children's file that has all the data needed for the program to work (the most needed is the child's picture) provided by parents to the school administration. The administration has the list of the pupils' data, to make the matching with the data obtained from the facial detector and the data from the pupil data list.

The camera set up to detect who is entering and getting out, and by the application , send notification to the parents and alert school administration in case of the person is unrecognizable, or the person is pupil. As many cases are there to consider as many states in the system to vary.

The services that the application provides for the parents are:

1. Sending notification with date and time stamped in case their child detected and recognized.
2. Sign up the child in case he is not.
3. give them access to check out the files in school.

The services provided to the school administration are:

1. **The pupils files:** By the time the camera detect the face and capture it, the program function compare it with the picture of the child in his file.
2. **A camera plugged to the computer system:** the camera function is to capture the scene all the time.

3. **The description and the functional software :** whenever someone comes inside the school early ,the camera capture his facial data in the real-time. Then, transfer instantly the data to the work space where it detect and compare the picture obtained from the camera and the pictures of the children files exhaustively, which means it's research test functioning facial recognizer development. Once the application recognize the face picture, it sends a notification to the parent to inform him that the pupil is in the school. If the application doesn't recognize the face, it Alert the administration that.

at the start of each period (1 hour) the school gate will open and the system works with the same functioning after refreshing the attendants list.(the way the administration and parents deal with the child is up to them).

1.6.3 Facial recognition:

The application protects the privacy of each party. Which means, the only people that can access to the notification, are the administration and the parents.

Facial recognition is the process of identifying or verifying the identity of a person using their face. It captures, analyzes, and compares patterns based on the person's facial details. Here are the steps of the facial recognition:

1. **The face detection** process is an essential step as it detects and locates human faces in images and videos.
2. **The face capture** process transforms analog information (a face) into a set of digital information (data) based on the person's facial features.
3. **The face match** process verifies if two faces belong to the same person.

If the camera captures a face. It then transforms it into digital data by applying **the HOG algorithm** which is accurate and computationally efficient and the fastest in speed test (0.011 seconds / image). Then comparing the image captured to those held in a database.

These automated systems can be used to identify or check individuals' identity in just a few seconds based on their **facial features**: spacing of the eyes, bridge of the nose, the contour of the lips, ears, chin, etc [14].

1.7 Related works

There are a lot of application that deals with children educating, and helps the parents monitor their children. These applications focus on improving the child's learning abilities, and provide safe and healthy tools for the kids to use. It also ease the communication between the administration/teachers and the parents . Here are some of the applications available:

1. **FamilyTime Parental Control App for Schools:** Technology doesn't have to be complicated or unsafe. At schools, FamilyTime helps you keep it simple and safe so children can use technology to the fullest without any potential risks or threats. Give the students a safe and healthy tech environment in the classroom that they deserve. FamilyTime location tracking lets you monitor and pinpoint the exact location of your students at any time. You can set up location-based fencing to be notified if a student is skipping on school or is somewhere they shouldn't be [15].



Figure 1.1: FamilyTime logo.

2. **Parental Control and Kids GPS: Kaspersky SafeKids:** This app is much more like a family locator and screen time management. Screen time and Manual blocking is possible through this app. Parents can create GPS geofences around specific locations and receive real-time alerts when their kids leave and arrive at school or any set zone.



Figure 1.2: Parental Control and Kids GPS: Kaspersky SafeKids.

- Screen Time Parental Control:** ScreenTime is a parental control app for Android and iOS that lets you manage the time your kids spend on their tablets and smart phones . Parents can encourage positive habits by setting your children tasks to complete, and reward additional screen time.ScreenTime parental control app allows you to block certain apps at certain times of day and also restrict activity during school hours.



Figure 1.3: Screen Time Parental Control logo.

4. Kids Place – Parental Control App

Parents who are looking to control their kid’s activities in the phone and manage their screen time can consider installing this efficient app. The ultimate goal of the app is to create a safe environment for your kid while exploring mobile technology [16].



Figure 1.4: Kids Place logo.

5. **Schoology:** It is a tool your child's teacher could utilize to keep them engaged in learning, even though they're not in a physical classroom. It also offers many resources to help keep you aware of upcoming due date and feedback from your child's teachers.



Figure 1.5: Schoology logo.

6. **Edmodo:** It is another classroom manager tool for teachers with built-in virtual classroom activities. Teachers can send and share messages with their students while also keeping you, the parent, updated with real-time grades and feedback on student performance[17].



Figure 1.6: Edmodo logo.

7. **Kidslox:** A parental control app needs to be on this list because it helps to ensure that your child's tablet or phone is used as a learning tool and not just a gaming one. By locking game or social media apps during school or homework time, you can help ensure that they're focusing on the right things.



Figure 1.7: Kidslox logo.

8. **myHomework:** is an organizer tool for students that allows them to effectively manage their school life. This tool helps students to monitor homework progress and track classes and other school events online. This cross-platform app was designed to help students become more self-disciplined and organized. Though elementary school kids could probably use it with parental assistance it really comes into it's own with slightly older kids[18].



Figure 1.8: myHomework logo.

9. **ParentSquare:** a Versatile communication tool foster parent engagement and involvement , a convenient way to help schools streamline communication among administrators, support staff, teachers, and parents.



Figure 1.9: ParentSquare logo.

10. **Remind:** Well-designed, highly effective messaging tool has the potential to keep students and families connected with their schools. If the teacher forgot to mention something in class, need parent volunteers, or want to give kids a quick review before tomorrow's test, this app can handle it.



Figure 1.10: Remind logo.

11. **SchoolCNXT:** If your school or district makes the investment, this is a neat and accessible way to keep parents engaged.



Figure 1.11: SchoolCNXT logo.

12. **TalkingPoints:** Multilingual texting tool enhances school-to-home communication. Easy-to-use tool for supporting communication and engagement with families in [19].



Figure 1.12: TalkingPoints logo.

Our work is based on a security surveillance camera system and a facial recognizer function. Using a camera will ease the parental control, and it is more effective to provide time stamped notifications and real-time extracted data. Our work is also based on databases in order to work with the application.

1.8 Conclusion

Parental monitoring during middle childhood can have a lifelong effect on children's health. Parental monitoring includes parents tracking their child's behavior at home, in school, and in community environments. Accomplishing this task effectively can be challenging because monitoring must balance the promotion of independence with communication of genuine concern about and interest in a child's activities[31]. That's where preferably come with the idea of setting security cameras system, and a software to prevent any inaction from happening.

Next chapter provides the conception of the work, modelization of the transactions in the system; like diagrams, and details of the tools that we need.

Chapter 2

Proposed Parental Control System

"Because never in my entire childhood did I feel like a child. I felt like a person all along—the same person that I am today!"

Orson Scott Card.

2.1 Introduction

PARENTAL monitoring is not an easy job, with responsibilities that seem to change every day. The daily tasks and roles you perform as a parent are bound to change as your child gets older, however, there is one task that is always important which is monitoring your child's contact with his or her surrounding world. Parents need to be aware of their children's activities and interactions through every age and stage of growth [1].

This chapter represents our contribution which contains a system architecture, description of needed tools and the sequences diagrams of all transactions registrations.

2.2 General Conception

An automated parental control in school analysis system is a process that detects the child attendance, is done without human intervention and is repetitive. This system realises a certain number of actions called tasks or operations. This section explains the complete block conceptual of the proposed system. It also presents a detailed explanation of each and every block.

2.2.1 System Architecture

The overall block conceptual of the proposed system is as shown in Figure 2.1. This proposed diagram consists of a real-time functioning and it includes a surveillance camera system attached to the control devices, as well as software and services.

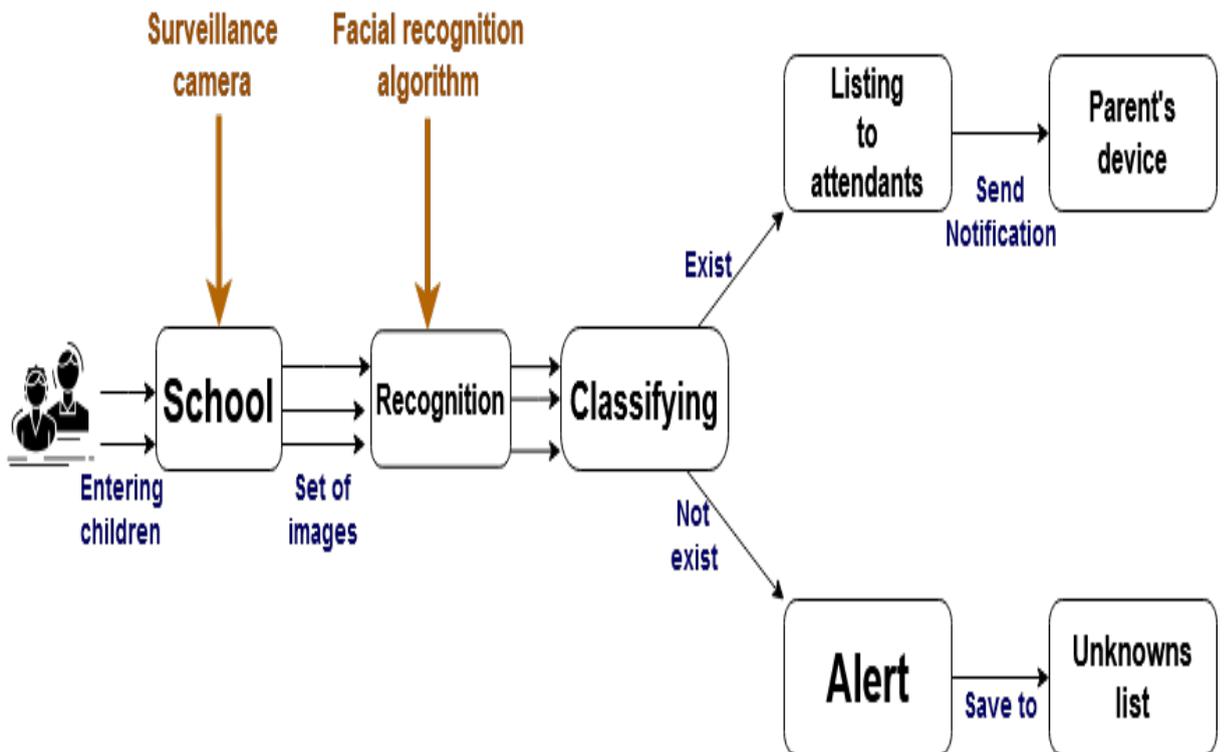


Figure 2.1: System Architecture of our proposed system.

2.2.2 System Operations

The operation of the real-time camera monitoring is in the school walk space, and the treatment of notifications and facial recognition are managed by the system at the work space. To achieve the tasks of management the technical means are (Figure 2.2):

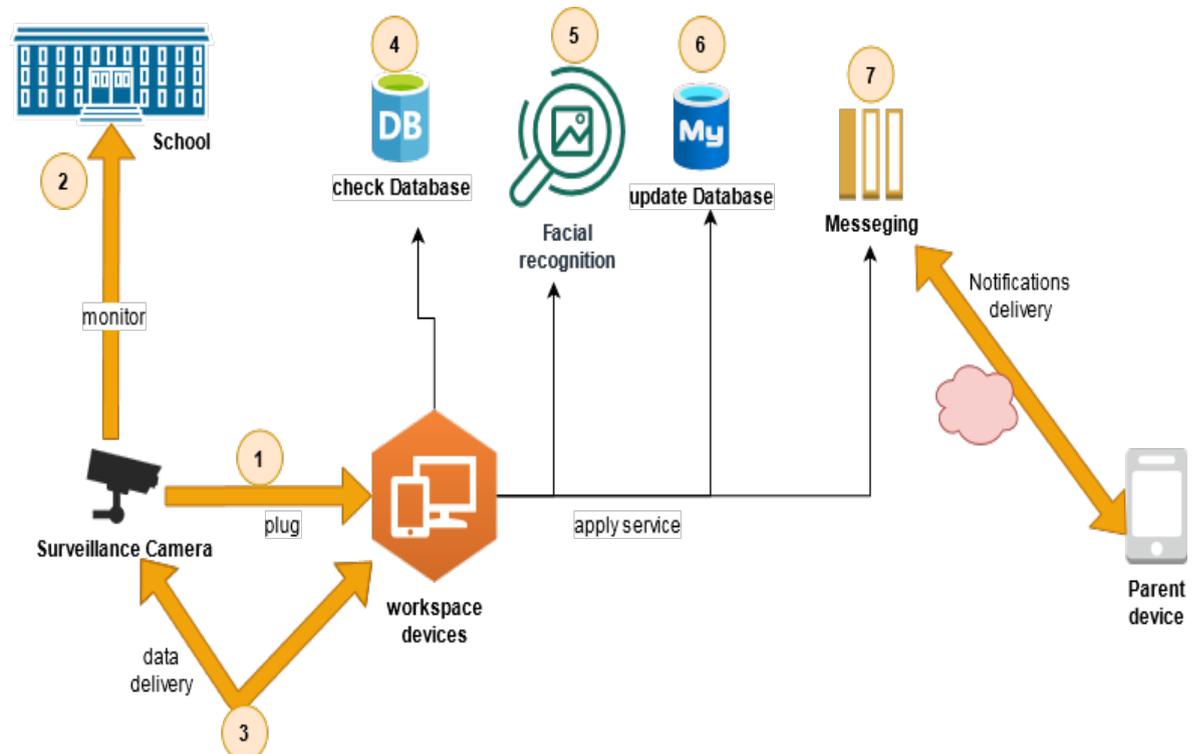


Figure 2.2: Diagram showing the tasks of the system

1. **Monitoring the school by surveillance camera:** the camera used specific one. it used usually in the security systems (See Chapter 3). It called surveillance camera system. It can be obtained with wires or wireless. we use it to capture the entering child and transfer the data to the workspace.
2. **Database treatment:** in this part, the system can either check the database (search in the database) to apply the facial recognition and to verify a sign up, or to update database in order to execute a sign up and to add child to the recognised list.

3. **Facial recognition:** Facial recognition has its steps too, we'll learn the main ideas behind this machine learning algorithm.

Step 1: Finding all the Faces

The first step in the pipeline is face detection. Obviously we need to locate the faces in a photograph before we can try to tell them apart, there are cameras and smartphones'cams that already has this feature which is automatic face detection. To detect faces we use a method created in 2005 called HOG or Histogram of Oriented Gradients. So,what is its mechanism? And how does it help?

To find faces in an image and obtaining a HOG data, we'll start by making our image black and white because we don't need color data to find faces. Then we'll look at every single pixel in our image one at a time. For every single pixel, we want to look at the pixels that directly surrounding it:

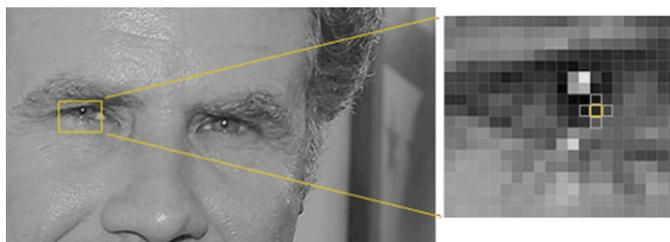


Figure 2.3: Example of a pixel in face and its surroundings

The goal is to figure out how dark the current pixel is compared to the pixels directly surrounding it. Then draw an arrow called gradient showing in which direction the image is getting darker. Repeating that process for every single pixel in the image ends up with every pixel being replaced by a gradient. These arrows show the flow from light to dark across the entire image:

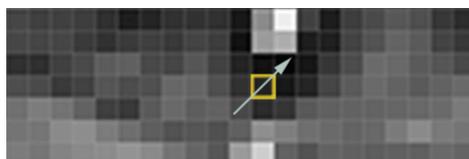


Figure 2.4: Example of a gradient

If we analyze pixels directly, really dark images and really light images of the same person will have totally different pixel values. But by only considering the direction that brightness changes, both really dark images and really bright images will end up with the same exact representation. Saving the gradient for every single pixel gives us way too much detail. It would be better if we could just see the basic flow of lightness/darkness at a higher level so we could see the basic pattern of the image.

To do this, we'll break up the image into small squares of 16x16 pixels each. In each square, we'll count up how many gradients point in each major direction (how many point up, point up-right, point right, etc...). Then we'll replace that square in the image with the arrow directions that were the strongest.

The end result is we turn the original image into a very simple representation that captures the basic structure of a face in a simple way which is HOG form. To find faces in this HOG image, all we have to do is find the part of our image that looks the most similar to a known HOG pattern that was extracted from a bunch of other training faces:

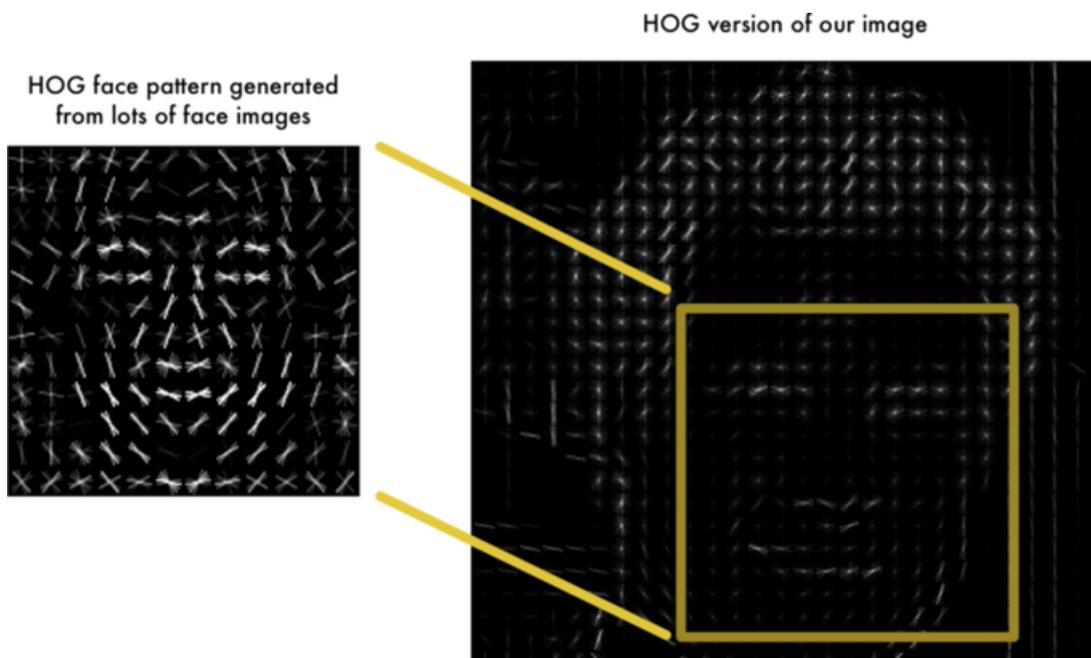


Figure 2.5: Similarity to face pattern HOG from a lot of people to an example HOG image

Step 2: Posing and Projecting Faces

After isolating the faces in the image, we deal with the problem that faces looking toward the camera and faces turned different directions look totally different to a computer. To account for this, we will try to warp each picture so that the eyes and lips are always in the same place in the image. This will make it a lot easier for us to compare faces in the next steps.

To do this, we are going to use an algorithm called face landmark estimation. There are lots of ways to do this, but we are going to use the approach invented in 2014 by Vahid Kazemi and Josephine Sullivan. The basic idea is we will come up with 68 specific points (called landmarks) that exist on every face (the top of the chin, the outside edge of each eye, the inner edge of each eyebrow, etc). Then we will train a machine learning algorithm to be able to find these 68 specific points on any face. Here The 68 landmarks we will locate on every face. This image was created by Brandon Amos of CMU who works on OpenFace:

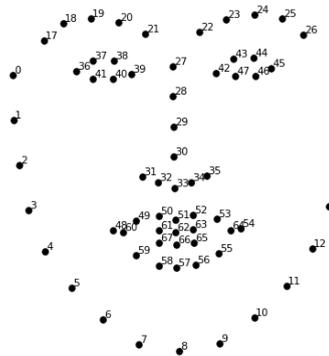


Figure 2.6: The 68 landmarks we will locate on every face

Now that we know where the eyes and mouth are, we'll simply rotate, scale and shear the image so that the eyes and mouth are centered as best as possible.

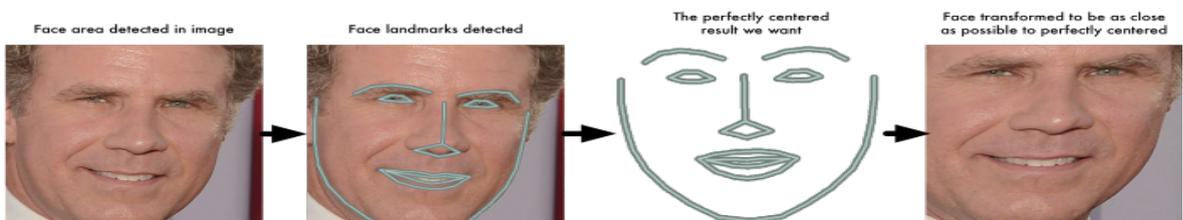


Figure 2.7: face rotation phases

Step 3: Encoding Faces The simplest approach to face recognition is to directly compare the unknown face we found in Step 2 with all the pictures we have of people that have already been tagged. When we find a previously tagged face that looks very similar to our unknown face, it must be the same person. There's actually a huge problem with that approach. A data storage with a lot users of a service with a lot of photos can't possibly loop through every previous-tagged face to compare it to every newly uploaded picture. It would take a long time. What we need is a way to extract a few basic measurements from each face. Then we could measure our unknown face the same way and find the known face with the closest measurements. For example, we might measure the size of each ear, the spacing between the eyes, the length of the nose, etc. So which measurements should we collect from each face to build our known face database?

Researchers have discovered that the most accurate approach is to let the computer figure out the measurements to collect. Deep learning does a better job than humans at figuring out which parts of a face are important to measure.

The solution is to train a Deep Convolutional Neural Network. So we are going to train it to generate 128 measurements for each face. The training process works by looking at 3 face images at a time: (1) load a training face image of a known person, (2) load another picture of the same known person, and (3) load a picture of a totally different person. Then the algorithm looks at the measurements it is currently generating for each of those three images. It then tweaks the neural network slightly so that it makes sure the measurements it generates for (1) and (2) are slightly closer while making sure the measurements for (2) and (3) are slightly further apart. After repeating this step a lot of times for a lot of images of a lot of different people, the neural network learns to reliably generate 128 measurements for each person. Any ten different pictures of the same person should give roughly the same measurements. The 128 measurements of each face is called an embedding. The idea of reducing complicated raw data like a picture into a list of computer-generated numbers comes up a lot in machine learning (especially in language translation). The exact approach for faces we are using was invented in 2015 by researchers at Google but many similar approaches exist.

The encoding process of training a convolutional neural network to output face embeddings requires a lot of data and computer power. Even with an expensive NVidia Telsa video card, it takes about 24 hours of continuous training to get good accuracy.

But once the network has been trained, it can generate measurements for any face, even ones it has never seen before! So this step only needs to be done once. OpenFace experts already did this and they published several trained networks which we can directly use. So all we need to do ourselves is run our face images through their pre-trained network to get the 128 measurements for each face. Here's the measurements for an image:

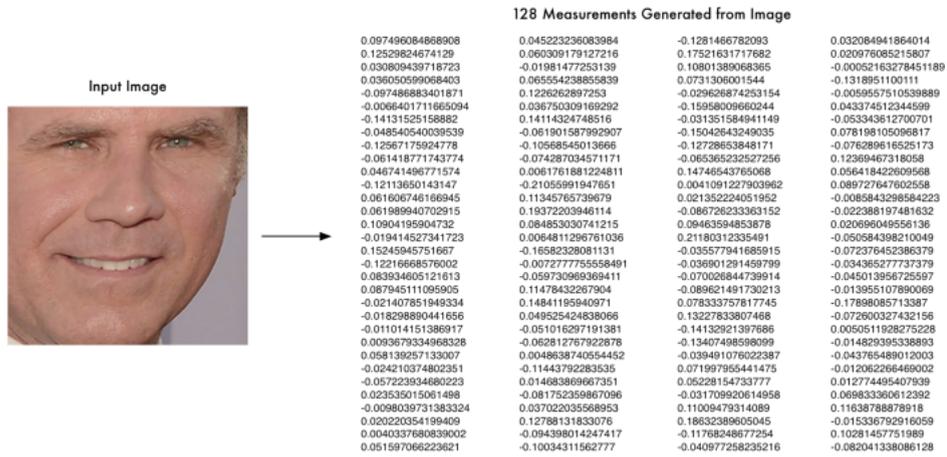


Figure 2.8: the embedding of an example image

Step 4: Finding the person's name from the encoding

Finally, we have to find the person in our database of known people who has the closest measurements to our test image and get the face distancing result. You can do that by taking the file name of the image and search for the name linked to it in the database.[26]

4. **Sending notifications:** By a button press from an mobile application, each parent will receive a letter contain the name of his child alongside the date and time of his detection by the camera, the mobile application get the database from the work space and transfer it to the root of the application every time we run it, which is after 1 hour for each run to be provided with a new attendants list.

2.3 Detailed Conception

A use case diagram at its simplest is a representation of a user's interactions with the system that shows the relationship between the user and the different use cases in which the user is involved. In this section we will describe user interaction with the mobile application (See Figure 2.9).

2.3.1 Scenarios Description

- In the beginning, the child must be signed up by his parent's demand so he can be known by the application system and attend classes.
- To apply facial recognition, the surveillance camera system must be installed.
- The facial recognition result could be face matched, in which case the notification will be sent to the parent, or face unknown.

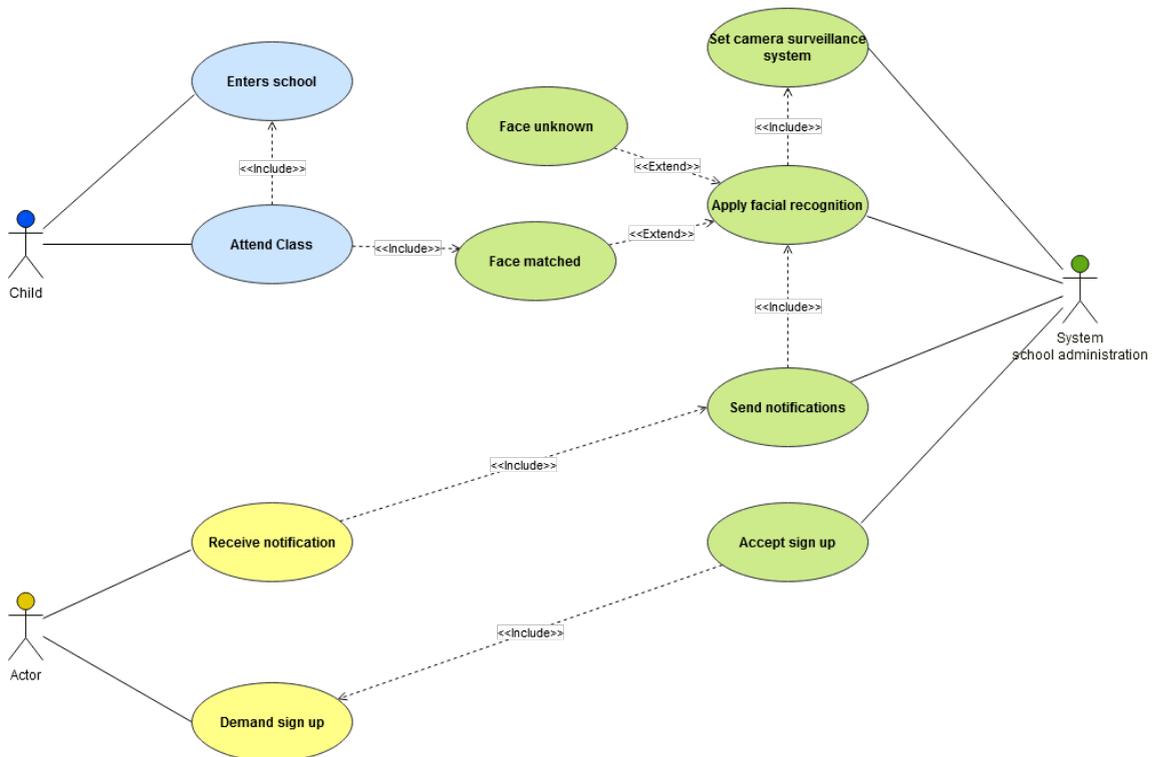


Figure 2.9: Use Case Diagram

2.3.3 Sequence Diagrams of the parent

- At first the two inter-actors connect to each other.
- To get notification from the school, the parent must sign up his child if he didn't.
- If the child already signed up, the parents return to the demand phase, else, the child sign up will be complete.
- Then, the administration will update the notification to send to the parents, and the parents will check them finally.

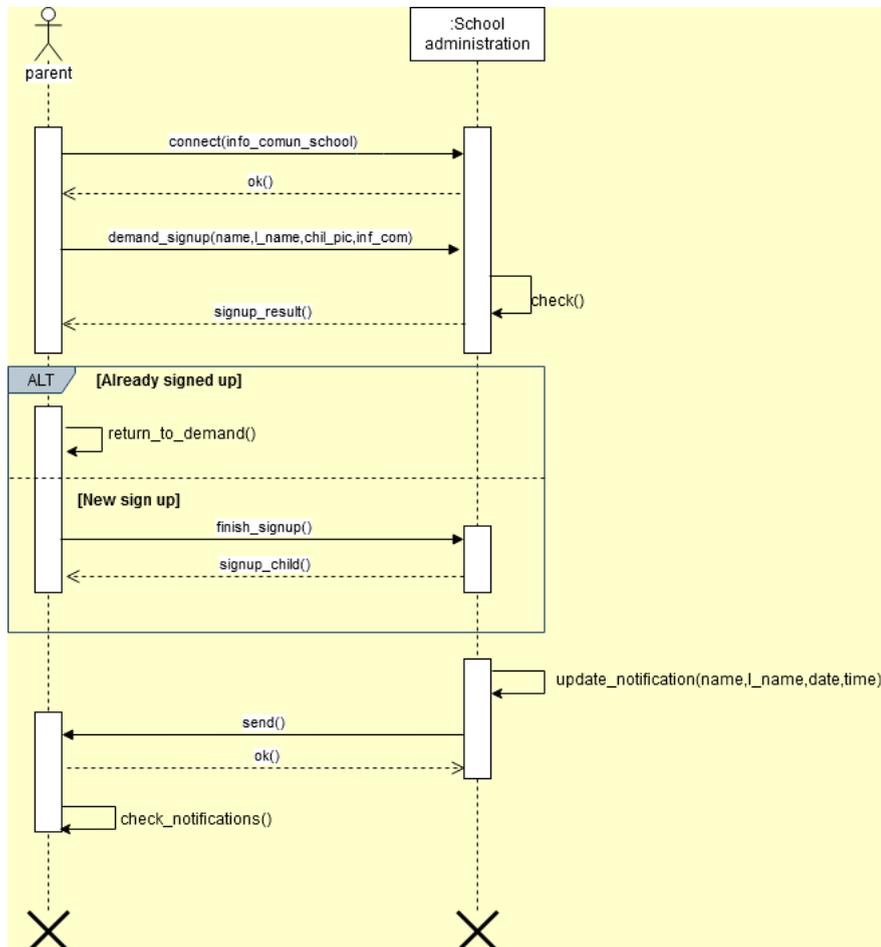


Figure 2.11: Parents Sequence Diagram

2.3.4 Administration Sequence Diagram

- first, the camera must be plugged so it can capture the child passing, and the picture data to the administration application.
- then, by applying the facial recognition, the child could be recognized so the school administration send notification to the parents, or, the child could be unknown.
- In case the child is not signed up, the parent demand the sign up and provide their communication information.

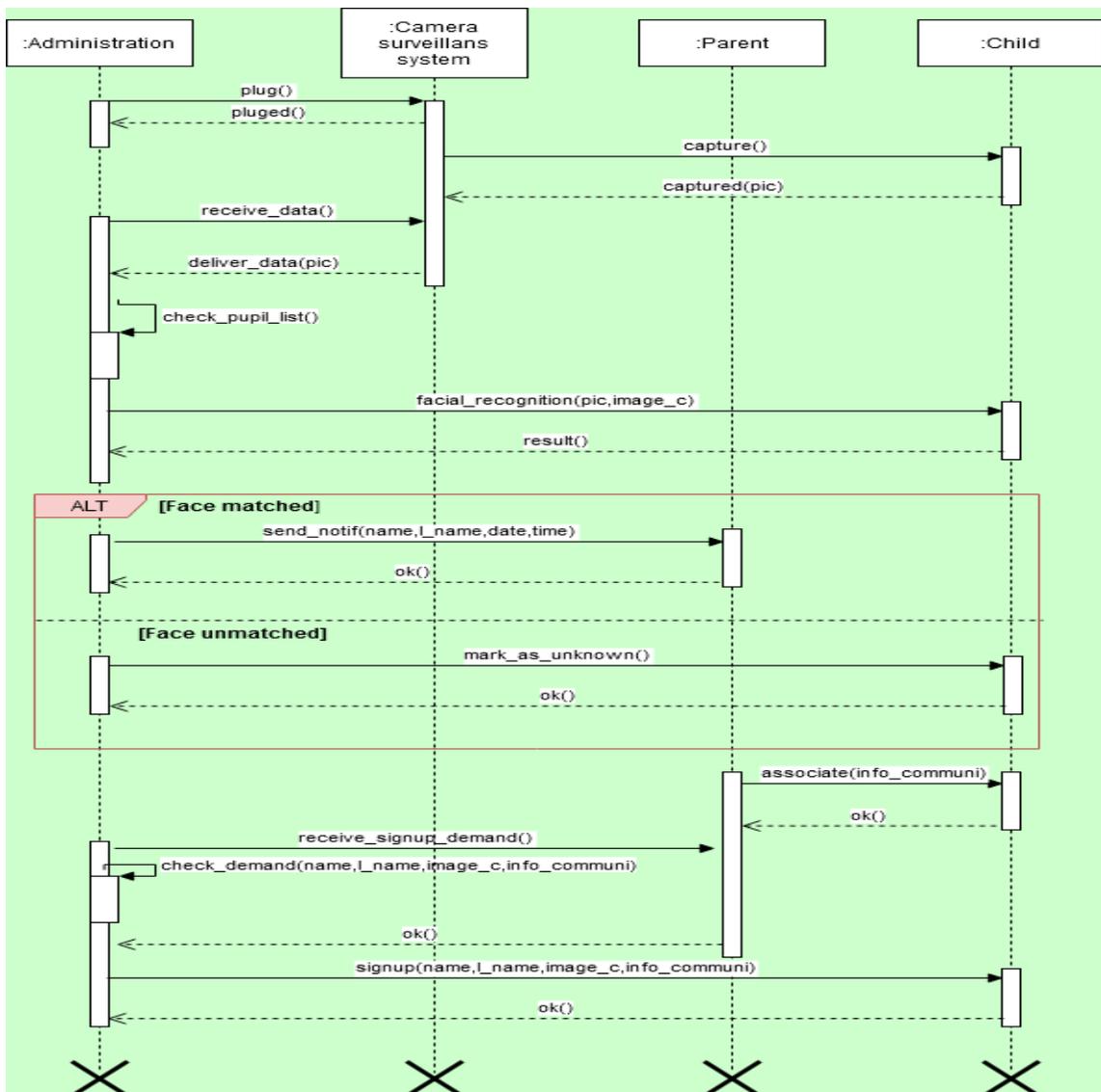


Figure 2.12: Administration Sequence Diagram

2.4 Conclusion

In order for the parents to keep in touch and updated of school activities and meetings. The administration sends notification to the parents for that. The administration can check the attendance of the school by security camera system along side with a device contain software that has facial detector, compare, and recognizer. This chapter focused about our proposed monitoring system of parental control to children in school, presenting a general conception, and modelization to the system using diagrams.

The implementation and testing of our system will be displayed in the last chapter.

Chapter 3

Implementation and Results

Childhood memories are sometimes covered and obscured beneath the things that come later, like childhood toys forgotten at the bottom of a crammed adult closet, but they are never lost for good.

Neil Gaiman

3.1 Introduction

THERE are a lot of method and ways to discipline the child but in the end that is up to the parents to deal parents and teachers work together to share the responsibility for educating pupil. As the middle of the school year approaches, parents may be wondering if their child is mastering the curriculum while meeting the goals and objectives written at an educational planning meeting, especially when it comes to school attendance, because it would't be a matter of just education, but also, a matter of serious security of health and manner [24].

In this chapter, the focus is on experimentation studies and evaluation of system. The implementation of our system makes it possible to evaluate the results obtained. This evaluations is performed using a set of tests.

3.2 Implementation

3.2.1 Hardwares Description

All the experiments are performed on a Dell laptop with 1.7GHz Intel Core (i3) processor and 4GB 1600 MHz DDR3 RAM.

3.2.1.1 Surveillance security camera CCTV

For testing the application we are using web cam, but, when implementing it in actual environmental place like school, preferably using security surveillance cameras. So here what needed to be known about the CCTV.

CCTV descriptions

Considering this topic is a public safety issue, installing a CCTV camera can provide both security and added peace of mind for the school children. A variety of CCTV camera systems exist; some are complex, others are relatively straightforward in terms of design and implementation.

Understanding Closed Circuit TV

CCTV stands for closed circuit television, meaning that it delivers video images over a self-contained network rather than broadcasting them to the public. It's frequently used for home and business security systems, showing images live to security guards and staff or storing them on VHS tapes or digital video recording systems for later playback if there's a crime or other incident.

Nowadays, we can connect a camera to a computer or loop camera data into a network so we can watch CCTV on a laptop or desktop screen. Some businesses and homes also now use cloud-based systems that store video on remote servers, where it can be analyzed and played back [20].

Choosing Security Cameras considerations

When choosing security cameras, placement needs (indoors or outdoors) should be considered, the surveillance range for choosing the right resolution, image quality, video recording options, and scalability so the surveillance system can be expanded with ease. Additionally, consider the features of each security camera.

- Camera resolution 1080p to 4K
- Night vision with infrared LED illuminators, and Camera resolution 1080p to 4K
- Remote video surveillance from anywhere, anytime, via PC, smartphone, or tablet
- Weather-resistant and vandal-proof design for reliable outdoor use
- Plug-and-play simplicity
- Motion detection
- Remote access, playback, and control



Figure 3.1: Closed Circuit Television Camera (CCTV Camera)

3.2.1.2 Cables and Connections

To continue understanding what the hardware devices used in a CCTV system are, what should be known is cables and connectors are critical components for the CCTV system. There are different types of cables and connectors, depending on the security cameras chosen, surveillance technology, and video recorders. These include plug-and-play combo cables, CAT5/6 ethernet cables for Network Video Recorder (NVRs) used in IP surveillance systems, RG-59 Siamese coax combo cables, and connection components.

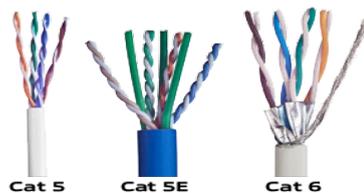


Figure 3.2: CAT5 and CAT6 ethernet cables

The right cabling is critical for the CCTV system. Also other accessories probably needed to complete the CCTV systems installation, such as power adapter cables, HDMI cables, connection tools, and crimping tools. Most complete CCTV security systems come with all the cables and connectors needed to get started [21].

RG-59 Siamese coax cable

RG59 cable has been around for a long time. This cable used to be what most people used for their cable TV connection and is very commonly installed in older homes and commercial buildings. The braided shielding in RG59 was designed around (relatively) long wave forms of megahertz interference. That makes it good for lower frequency signals (anything under about 50 MHz). It is commonly used for composite or component video signals (often in the mini-coax variety). That also makes it a good choice for a closed circuit television (CCTV) video surveillance system. We can even make the installation easier by getting what's called "Siamese coaxial cable". This cable consists of a RG59 cable merged together with a 2C power cable. By using this type of cable, the power and video for the security cameras can be run simultaneously, effectively cutting the install time in half [22]. Here is a product example of RG59 (see the figure 3.3)

- Professional quality RG59 siamese cable by Nordstrand for use with most CCTV camera systems, including surveillance cameras
- Each reel contains 500 ft of 20 AWG RG59 coaxial cable with a DC dual-core power cable
- Transmits both data and power
- Suitable for indoor or outdoor use
- Supplied on wooden reels for easy storage and installation

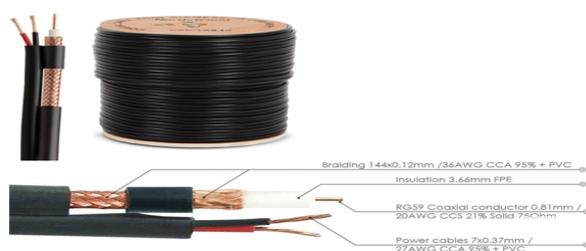


Figure 3.3: Black RG-59 Siamese coax cable

Analog Camera Cables and Connectors

When looking for a security solution for the home or business, it is important to spend time researching which type of camera is best suited for the security needs. Not all camera cables and connectors are the same. There are three types of cables and connectors that are common in CCTV systems: BNC, DIN, and RCA. This guide will help to learn more about the advantages and disadvantages of each of these connectors, and how to convert between them.

1. BNC Connector

BNC is an abbreviation for Bayonet-Neil-Concelman. It is an industry standard for transmitting a video signal over a coaxial cable. It features a unique locking mechanism to ensure the cable is firmly secured to the Digital Video Record DVR/monitor and will not come loose.

Advantages

- Industry standard for CCTV cameras.
- BNC cables are good for a distance of 300 ft (depending on cable quality).
- BNC cables lock in place, ensuring a consistent image and no unwanted disconnection.

Disadvantages

- Requires a separate power source.
- Only transmits video.
- Does not support audio.



Figure 3.4: BNC Connector

2. DIN Connector

DIN is an abbreviation for Deutsches Institut für Normung. Lorex DIN connectors are round with pins arranged in a circular pattern, and can have either 4 or 6 pins (depending on model).

Here is an example of a 6-Pin DIN Connection and Pin-out (see figure 3.5)

Pin 1: + 12V Input

Pin 2: Audio to Camera

Pin 3: Alarm Signal

Pin 4: NC (no use)

Pin 5: Audio from camera

Pin 6: Video from camera

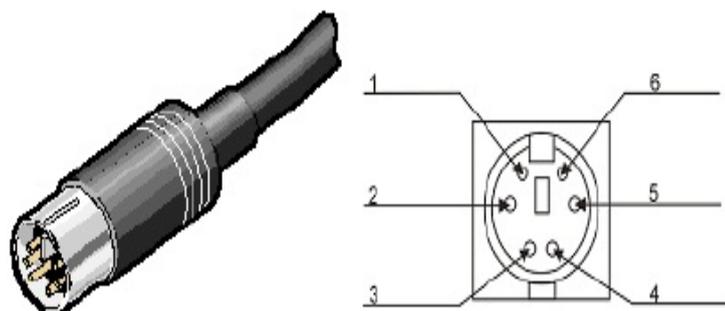


Figure 3.5: 6-Pin DIN Connection and Pin-out

Advantages

- Easy to connect.
- No need for a separate power source. The camera will be powered by the system.
- Supports two-way audio (depending on camera model)
- Only one cable required to run between the camera and the system.
- DIN cables are good for a distance of up to 300 ft.

Disadvantages

- Pin configuration is proprietary to the camera manufacturer so DIN cameras cannot be mixed from different manufacturers.
 - Not as common as BNC Cameras.
 - May have to convert to BNC to connect to non Lorex systems.
 - Physical connection to the DVR / observation system is not locked-in, as compared to BNC connections.
 - Not all Lorex systems have DIN inputs. Check the instruction manual of the Lorex system for details.
3. **RCA connector** RCA is a standard cable used to transmit analog video and audio between many devices such as TVs, VCRs, DVD players, stereo systems, and video game consoles. The yellow cable is for video. The black and red cables (or white and red) are used for audio: Black/White and Red cables are usually stereo; a single White cable is mono.



Figure 3.6: RCA connector

Advantages

- Standard for audio and video in consumer electronics industry.
- Widely available accessories.

Disadvantages

- RCA cables are good for a distance of 180 ft, depending on cable quality.
- Physical connection to the DVR / observation system is not locked-in, as compared to BNC connections.
- Not all Lorex systems have RCA inputs. convert RCA to BNC or DIN could be needed [23].

Steps of connecting the CCTV to the PC

1. Installing CCTV Software

Insert the software CD or DVD supplied with the CCTV camera into the computer's optical drive or download the software from the manufacturer's website. Proceed with the automated installation of the software.

2. Mounting the Camera

Mounting or positioning the camera in a location that affords a clear, well-lighted view of the area we want to record. Precising the aim of the camera will be fine-tuned once a signal is being passed to the computer.

3. Connecting the Camera to the Computer

Some CCTV systems use coaxial cable, while others use standard USB cable. It's necessary to consult the documentation that came with the camera to determine the proper type of cabling to use for the system. Some CCTV setups, feature a router through which we can connect multiple cameras.

4. Connecting the Camera to a Power Supply

Some USB CCTV systems provide power to the cameras through the USB cabling itself, eliminating the need for a dedicated power source for each camera.

5. Launching the CCTV Software and Configure

Launching the CCTV camera's software on the computer and proceed with the configuration of the camera or cameras. At this point, we can properly aim and focus the camera to ensure optimal video quality[20].

3.2.1.3 Android phone device

This android phone is the environment of our mobile application. The phone is provided with SIM card to send SMSs notifications and ADB debugger. Here are the properties of the phone:

Device product: HUAWEI Y7

Model: DUB-LX2

Android version: 8.1.0

CPU: Qualcomm Snapdragon 450

RAM: 3.0 GB

Internal Storage: 32.00 GB

Screen :1520 x 720



Figure 3.7: HUAWEI Y7 Android Phone

We use USB 3.0 plugged with the phone for data transmission and ADB debugging, it keeps light of connector and front side of metal plug the same side. Specification:

Standard charging current: 2.4A

Length: 1000mm



Figure 3.8: USB 3.0 Cable

3.2.2 Softwares Description

During the implementation of our project, we need two different kind of softwares. First, we have utilized certain open source programming languages. Secondly, we developed some applications by softwares IDE.

3.2.2.1 Programing Language

- **Python¹**: is a high-level programming language designed to be easy to read and simple to implement. the facial recognition application is written in Python language.
- **SQLite²**: SQLite is a relational database management system contained in a C programming library. SQLite database files are commonly used as containers to transfer rich content between systems and as a long-term archival format for data.
- **Java³**: Java is a high-level programming language developed by Sun Microsystems. It was originally designed for developing programs for set-top boxes and handheld devices, but later became a popular choice for creating web applications. The mobile application requires both Java and XML laguages. Beside, we use java language to implement the administration service.
- **XML⁴**: Stands for "Extensible Markup Language." XML is used to define documents with a standard format that can be read by any XML-compatible application. We use the XML to design the mobile application.

¹<https://www.python.org/>

²<https://www.sqlite.org/index.html>

³<https://www.java.com/fr/download/>

⁴<https://www.w3.org/XML/>

3.2.2.2 Softwares IDE

- **Spyder⁵**: Spyder is a free and open source scientific environment written in Python, for Python, and designed by and for scientists, engineers and data analysts. It features a unique combination of the advanced editing, analysis, debugging, and profiling functionality of a comprehensive development tool with the data exploration, interactive execution, deep inspection, and beautiful visualization capabilities of a scientific package. we use Spyder to develop the facial recognition service.



Figure 3.9: Logo of Spyder.

- **Android Studio⁶**: Android Studio is the official integrated development environment (IDE) for Android application development. It is based on the IntelliJ IDEA, a Java integrated development environment for software, and incorporates its code editing and developer tools. We used this IDE software to develop our part of mobile application.



Figure 3.10: Logo of Android Studio.

⁵<https://www.spyder-ide.org/>

⁶<https://developer.android.com/studio>

- **NetBeans**⁷: NetBeans IDE is a free, open source, integrated development environment (IDE) that enables you to develop desktop, mobile and web applications. The IDE supports application development in various languages, including Java, HTML5, PHP and C++. The IDE provides integrated support for the complete development cycle, from project creation through debugging, profiling and deployment. We use it to develop the administration service and design it.



Figure 3.11: Logo of NetBeans.

3.2.2.3 Libraries

Here are the Libraries necessary to develop the facial recognition application.

1. **Dlib**⁸: Dlib is a modern C++ toolkit containing machine learning algorithms and tools for creating complex software in C++ to solve real world problems. It is used in both industry and academia in a wide range of domains including robotics, embedded devices, mobile phones, and large high performance computing environments. Visual studio must be installed as a compiler.
2. **OpenCV-Python**⁹: OpenCV-Python is the Python API for OpenCV, combining the best qualities of the OpenCV C++ API and the Python language. OpenCV-Python is a library of Python bindings designed to solve computer vision problems. OpenCV-Python makes use of Numpy, which is a highly optimized library for numerical operations with a MATLAB-style syntax. All the OpenCV array structures are converted to and from Numpy arrays.
3. **facial-recognition**¹⁰: The library uses many built-in libraries such as Dlib and it uses machine learning to recognize the faces with an accuracy of 99.38%.

⁷<https://netbeans.apache.org/>

⁸<http://dlib.net/>

⁹https://docs.opencv.org/master/d0/de3/tutorial_py_intro.html

¹⁰https://pythonhosted.org/face_recognition/readme.html

3.2.3 Development part

we realise two applications in addition of the administration services like data shower and pupils sign up: the Attendance system by facial recognition software, and Notification Sender with mobile applications developer.

3.2.3.1 Attendance system and facial recognition

First, we import these libraries in Attendance System.py: cv2 from OpenCV to show the visual results, facial-recognition to locate the facial landmarks and encode the images and compare them, os to read and write files from paths, datetime and timedelta to mark the the date and time of the attendance and measure it. Beside of that we import the DatabaseScript.py that contain all the required SQL queries methods for the program.

```
import cv2
import face_recognition
import os
import numpy as np
from datetime import datetime, timedelta
import databaseScript
```

Figure 3.12: python code libraries.

In DatabaseScript.py we read our database that we put it in the asset of the mobile application package, we put the database there because, in order to read an already created external database from the phone the database must be in the assent folder of the application package to copy it from there and past it in the root of the application in the phone storage. the essential tables in the databases are:

- **Pupils:** contain the name of pupil, last name, the contact of his parents, and his id which has the same reference of his image in pupils folders.
- **Attendance:** contain the id of the pupil, his full name, and the date an time of his appearance.
- **Training:** this table contain the references of the training images, each pupil has 10 images there beside his image in the pupils folder, each 10 images has the same id. So this table contain the reference of the image, and the id of the pupil.

```
import sqlite3
from datetime import datetime
conn=sqlite3.connect('C:\\Users\\client\\AndroidStudioProjects\\NotificationSender\\app\\src\\main\\assets\\databaseAttendar
c = conn.cursor()
c2 = conn.cursor()
c3 = conn.cursor()
```

Figure 3.13: DatabaseScript.py part that show the database location.

Now, back to **Attendance System.py**, we have the directories: training folder that contain trained images, and unknown folder that contain the images of the unknown people that got captured before with date an time in the database (table name: **unknown**). Beside of that, we have to import every image in the trained images from **myList** that load all the files from the folder and add them to the list **images**. In case face captured is recognized, we will get the name of the image without the extension (.jpg, .png, .ect) and add it to the list **className**. This abstracted name is the reference that we use to search for the id of the pupil. To load the images from the folder we can use the function that come with OpenCV which is: **cv2.imread**.

```
path="training"
directory = "C:\\Users\\client\\Desktop\\Attendance-Face-recognition-system-main\\python3 scripts\\unknowns"
images=[]
classNames=[]
mylist=os.listdir(path)
#print(myList)
for cl in myList:
    curImage=cv2.imread(f'{path}/{cl}')
    images.append(curImage)
    classNames.append(os.path.splitext(cl)[0])
```

Figure 3.14: loading the trained images and the references instructions.

Then, we encode every image by calling the method **findEncodingImg(images)**. before encoding them, we must convert the images from BGR to RGB, because, the facial recognition library treat images in RGB. BGR and RGB referse to **Blue,Green,Red** and **Red,Green,Blue** respectfully, and the both are the subpixels coloring forms.

```
def findEncodingImg(images):
    encodeList=[]
    for img in images:
        img=cv2.cvtColor(img, cv2.COLOR_BGR2RGB)
        encode=face_recognition.face_encodings(img)[0]
        encodeList.append(encode)
    return encodeList
```

Figure 3.15: findEncodingImg(images) method.

After that we start up the camera. We are testing with the webcam so we can use the function `cap=cv2.VideoCapture(0,cv2.CAP_DSHOW)`. Then, we resize the camera video screen and Convert the image capture to RGB too, and find the face location in the image (`imgS`), to do that, the facial recognition software is in the process of finding the landmarks of the face like we learned how in Chapter 2. Now we encode the face located (`faceCurFrame`) and compare the embedding with the embedding of the list of trained images that already encoded before. every comparing of the function `face_recognition.face_distance (known_face_encodings, encodeFace)` return a face distance after calculating distance of the 128 measurements of the both captured image and current image of the training image. So we extract the less distance from the distances list, because, the less distance get the more accurate the result of face match. The face distance value interval is between(0.0) to (1.0).

```
while True:
    success,img=cap.read()
    imgS=cv2.resize(img, (0,0),None,0.25,0.25)
    imgS=cv2.cvtColor(imgS, cv2.COLOR_BGR2RGB)
    faceCurFrame=face_recognition.face_locations(imgS)
    encodeCurFrame=face_recognition.face_encodings(imgS,faceCurFrame)
    for encodeFace,faceLoc in zip(encodeCurFrame, faceCurFrame):
        matches=face_recognition.compare_faces(known_face_encodings, encodeFace)
        faceDis=face_recognition.face_distance(known_face_encodings, encodeFace)
        #print(faceDis)
    matcheIndexes=np.argmin(faceDis)]
```

Figure 3.16: facial comparing functions.

If the less face distance in the list is less than (0.6 in this case), usually the the function `face_recognition.compare_faces (known_face_encodings, encodeFace)` return **True** Boolean value. The issue now if there are two children or more look like each other, one is a pupil and the other one is not, the pupil get a face distance less than (0.52), the unknown child might recognized as that pupil but not as accurate when the pupil appeared, his smallest face distance is around (0.53) and (0.6). so we define a condition to not to be recognized if the least face distance is more than (0.52).

```
if(matches[matcheIndexes]):
    if(faceDis[matcheIndexes]<0.52):
        print(faceDis[matcheIndexes])
        im=classNames[matcheIndexes]
        name=databaseScript.search_name(im).upper()
        idd=databaseScript.search_id(im)
        print(name)
        # print(faceDis)
```

Figure 3.17: recognizing the face.

After that, we search for the name of the pupil in the Database equivalent to the image reference linked with pupil ID show rectangle with the name of the pupil in the capture image (in the limits of the landmarks). Then we call the method `check_name_att(name)` to add to Attendance table.

```

y1,x2,y2,x1=faceLoc
y1,x2,y2,x1=y1*4,x2*4,y2*4,x1*4
cv2.rectangle(img, (x1,y1), (x2,y2), (0,255,0),2)
cv2.rectangle(img, (x1,y2-35), (x2,y2), (0,255,0),cv2.FILLED)
cv2.putText(img, name , (x1+6,y2-6), cv2.FONT_HERSHEY_COMPLEX, 1, (255,255,255),2)
check_name_att(name)

```

Figure 3.18: Adding to to Attendance table.

In `check_name_att(name)`, we check for two measurement: The first is if the current hour is different than the hour marked in the 1 element table **hour** in the database, the system reset the Attendance table and add the pupil as the first attendant and mark the current hour in the table **hour** and replace the old hour because the school gate open after every hour in the school period. The second is if the pupil in the **attendance** table a minute before, the system doesn't put him again in the **attendance** table.

```

def check_name_att(name):
    now=datetime.now()
    d1=now.strftime("%d/%m/%Y %H:%M:%S")
    befor= now - timedelta(minutes = 1)
    d2=befor.strftime("%d/%m/%Y %H:%M:%S")
    # d1 = now.strftime()
    if(databaseScript.parc_att()):
        databaseScript.markHour(now.strftime("%H"))
    else:
        if(databaseScript.checkhour(now.strftime("%H"))):
            databaseScript.resetdata()
            databaseScript.create_data()
            databaseScript.markHour(now.strftime("%H"))

    if(not databaseScript.name_exist(name,d1,d2)) :

        dtstring=now.strftime("%d/%m/%Y %H:%M:%S")
        databaseScript.insert_data(idd,name,dtstring)

```

Figure 3.19: `check_name_att(name)` method.

Finally, we shut out the camera with a key press.

```

cv2.putText(img, 'press q to exit' , (10,18), cv2.FONT_HERSHEY_COMPLEX, 0.8, (0,0,255),2)
cv2.imshow("Attendance System", img)
if(cv2.waitKey(1) & 0xFF== ord('q')):
    break
cap.release()
cv2.destroyAllWindows()

```

Figure 3.20: Pressing the key to shut out code.

3.2.3.2 Notification Sender

First, we put these permissions in the manifest, in order to send SMS and read the existed database (see figure 3.21). In database helper class, we define the attribute

```
<uses-permission android:name="android.permission.WRITE_EXTERNAL_STORAGE" />
<uses-permission android:name="android.permission.READ_EXTERNAL_STORAGE" />
<uses-permission android:name="android.permission.SEND_SMS"/>
```

Figure 3.21: Manifest's permissions.

and copy the database to the root of the application in the phone. **DB_PATH** refer to the root path.

```
public class DBHelper extends SQLiteOpenHelper {

    String DB_PATH = null;
    private static String DB_NAME = "databaseAttendance.db";
    private SQLiteDatabase myDataBase;
    private final Context myContext;

    public DBHelper(Context context) {
        super(context, DB_NAME, factory: null, version: 1);
        this.myContext = context;
        this.DB_PATH = "/data/data/" + context.getPackageName() + "/" + "databases/";
        Log.e( tag: "Path 1", DB_PATH);
    }
}
```

Figure 3.22: Database helper class constructor.

What we need to import essentially in this class are: SQLite libraries, and io for treating with external files..

```
import android.database.Cursor;
import android.database.SQLException;
import android.database.sqlite.SQLiteDatabase;
import android.database.sqlite.SQLiteException;
import android.database.sqlite.SQLiteOpenHelper;

import java.io.FileOutputStream;
import java.io.IOException;
import java.io.InputStream;
import java.io.OutputStream;
```

Figure 3.23: Importing SQLite and io libraries.

The mobile application cannot directly read and write from database in the PC by USB. The mobile application read and write only from the application database in the root of the phone which is a private path and cannot be accessed unless we root the phone, but, that cause a high risk. However, we can copy it from the PC external folder and put it in the root.

To copy the database from the computer to the root of the phone storage, the database must be in the assets folder of the application package, because, to copy files to a remote device, the assets folder is the only external folder that the system can read and copy from, by using the function `Context.getAssets()`. Then we open the databases and copy the data and put it in the application root path using bytes buffer.

```
| try {
    InputStream myInput = myContext.getAssets().open(DB_NAME);
    String outFileName = DB_PATH + DB_NAME;
    OutputStream myOutput = new FileOutputStream(outFileName);
    byte[] buffer = new byte[1024];
    int length;
    while ((length = myInput.read(buffer)) > 0) {
        myOutput.write(buffer, 0, length);
    }
    myOutput.flush();
    myOutput.close();
    myInput.close();
} catch (Exception e)
{e.printStackTrace();}
}
```

Figure 3.24: Database copying to the app root method code.

Then we call that method in the `createDataBase()` method.

```
public void createDataBase() throws IOException {
    this.getReadableDatabase();
    try {
        copyDataBase();
    } catch (IOException e) {
        e.printStackTrace();
        throw new Error("Error copying database");
    }
}
```

Figure 3.25: `creatDataBase()` method code.

Then, we are creating a method to open the database from the root an use it.

```
public void openDataBase() throws SQLException {
    String myPath = DB_PATH + DB_NAME;
    try {
        myDataBase = SQLiteDatabase.openDatabase(myPath, null, SQLiteDatabase.OPEN_READONLY);
    } catch (Exception e){e.printStackTrace();}
}
```

Figure 3.26: Opening the database method code.

In the **MainActivity.java**, once the send button is pressed we call the method that copy and create database that we seen before.

```
try {
    DB.createDataBase();
} catch (IOException e){
    e.printStackTrace();
}
```

Figure 3.27: Create the database after pressing the send button.

Then, we write these instructions: **DB.openDataBase();**

Cursor res = DB.getdata(); to read all the data from **Attendance** table.

After that, we get all their parents contacts from the database. If the permission granted we send notification to each parent about their child appearance. The notification contain the full name of the child and the date and time stamp. If the permissions is not granted yet, we request for a permission.

```
while (res.moveToNext())
{
    if(ContextCompat.checkSelfPermission( context: MainActivity.this , Manifest.permission.SEND_SMS) == PackageManager.PERMISSION_GRANTED)
    {
        String contact = DB.getContact(res.getString( columnIndex 0));
        String noti= res.getString( columnIndex 1)+"\n"+res.getString( columnIndex 2);
        sendMessage(noti,contact);
    }else {
        ActivityCompat.requestPermissions( activity: MainActivity.this, new String[]{Manifest.permission.SEND_SMS}, requestCode: 100);
    }
}
```

Figure 3.28: Sending the notifications by pressing the button.

This is the method we call to send the notification **sendMessage(note,contact)**, and the method to request permission to send message (see figure 3.29).

```
if(!note.equals("") && !contact.equals("")){
    SmsManager mySmsManager = SmsManager.getDefault();
    mySmsManager.sendTextMessage(contact,null, note, null, null);
}

public void onRequestPermissionsResult(int requestCode, @NonNull String[] permissions, @NonNull int[] grantResults) {
    super.onRequestPermissionsResult(requestCode, permissions, grantResults);
    String note = "",cont = "";
    if(requestCode == 100 && grantResults.length > 0 && grantResults[0] == PackageManager.PERMISSION_GRANTED){
        sendMessage(note,cont);
    }else {
        Toast.makeText(getApplicationContext(), text: "Permission Denied!", Toast.LENGTH_SHORT).show();
    }
}
```

Figure 3.29: **sendMessage(note,contact)** and request permission method code.

3.3 Results and Discussions

Here are the list of pupils that we are setting (Figure 3.30). each pupil has 10 images in training folder, plus, a representative file image.

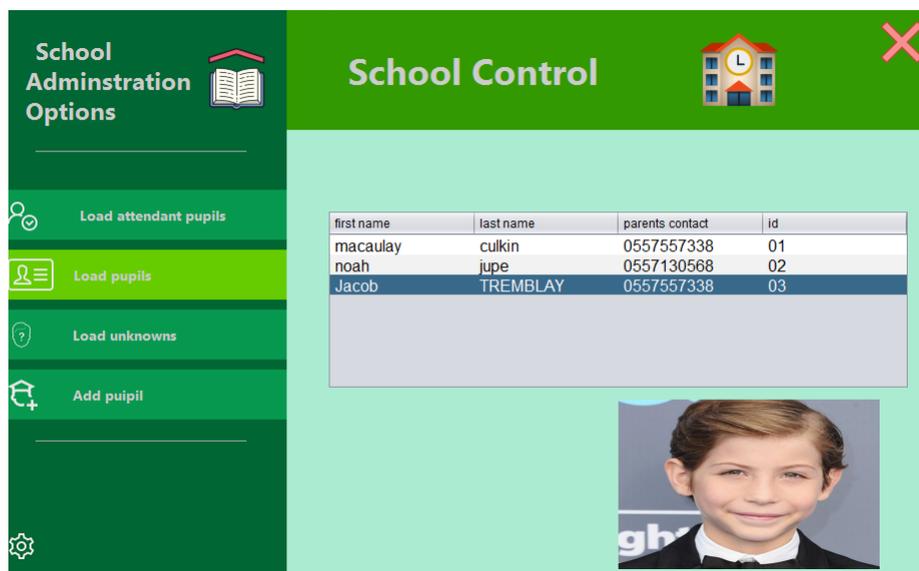


Figure 3.30: List of the pupil interface.

Here is the training folder (Figure 3.31)

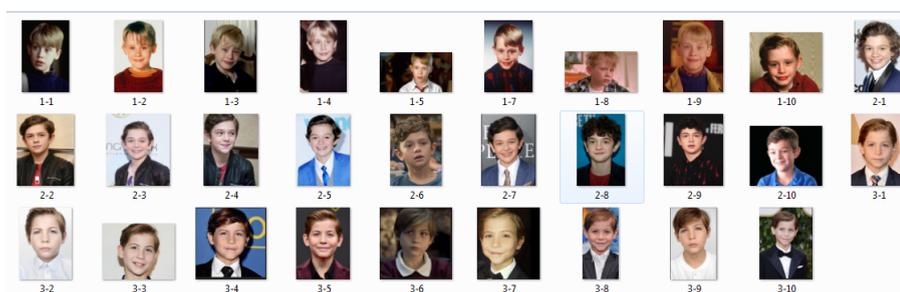


Figure 3.31: Training folder.

This is the attendance list that we get from our previous test (Figure 3.32).

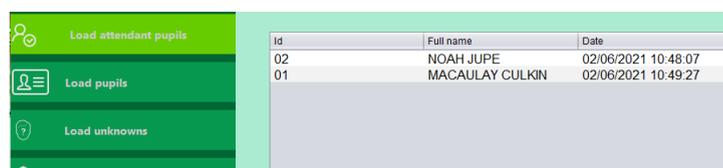


Figure 3.32: Previously tested attendance list.

As we can see in figure 3.32, the hour of these attendances are different than the current hour which is **18 (06pm)**. So if we start up the attendance system, this list will reset. In figure 3.33, we can see that the child on the right is marked as unknown, because, he is not from the pupil list.



Figure 3.33: Testing facial recognition functioning.

We can test on more pupils to fill the attendance table.

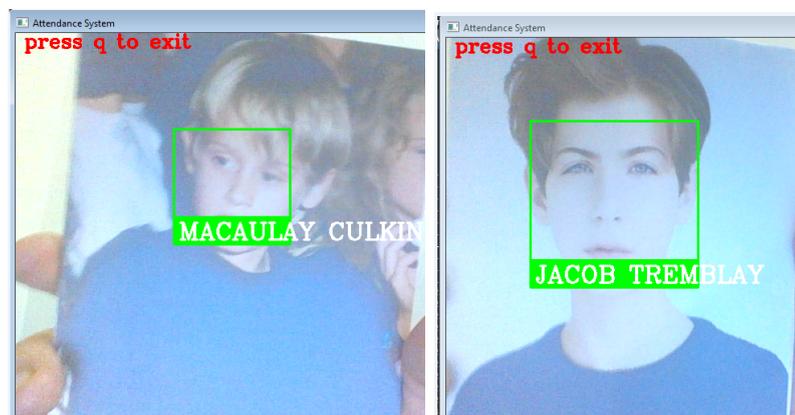


Figure 3.34: facial recognition functioning on pupils.

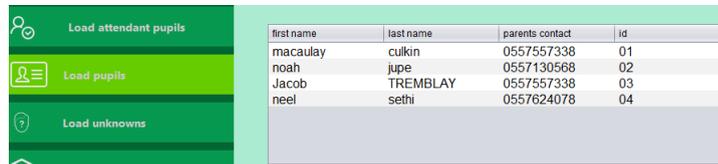
in order for the unknown child from figure 3.33 to be recognized, he must sign up.

First Name	neel
Last Name	sethi
Image	04
Parents number	0557624078
Parents name	Houd
<input type="button" value="EXIT"/> <input type="button" value="ADD"/>	

Figure 3.35: Signing up a child.

In the process of signing up the parents should present 10 training image and paste them in **10images** folder in the java package. The system automatically add them in **training** folder. Beside of that, he must present a different image that represent his son's pupil file.

After the sign up is executed, the child will be add to the pupil list.



first name	last name	parents contact	id
macaulay	culkin	0557557338	01
noah	jupe	0557130568	02
Jacob	TREMBLAY	0557557338	03
neel	sethi	0557624078	04

Figure 3.36: The pupils list after adding the new child.

Now, the child would be recognized and added to the attendance table by the attendance system.

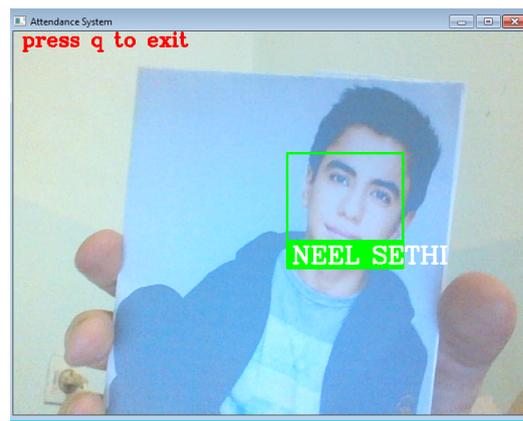
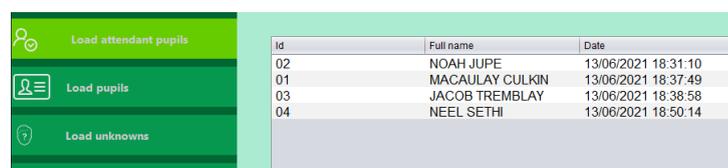


Figure 3.37: Recognizing the new child.

This is the attendance table (see figure 3.38).As we can see, the system reset the previous attendance list from figure 3.32



Id	Full name	Date
02	NOAH JUPE	13/06/2021 18:31:10
01	MACAULAY CULKIN	13/06/2021 18:37:49
03	JACOB TREMBLAY	13/06/2021 18:38:58
04	NEEL SETHI	13/06/2021 18:50:14

Figure 3.38: The attendance list.

Beside of these services, you can show the unknowns table, parents table, training images, and search by pupil ID.

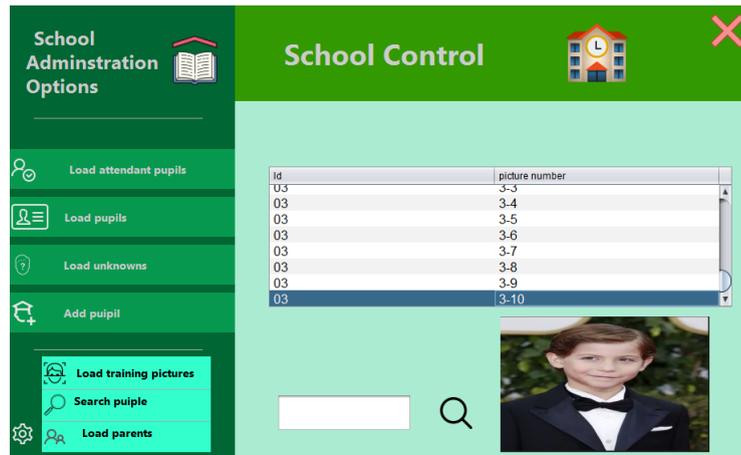


Figure 3.39: The application other services.

Finally, we send these by the **Send Notifications** button press in the mobile application after running it.

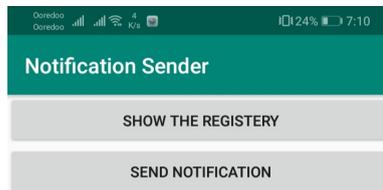


Figure 3.40: The mobile application interface.

We can show list of the attendance by pressing **Show the registry** button.

```
id :02
name :NOAH JUPE
Date and time of appearance :
13/06/2021 18:31:10

id :01
name :MACAULAY CULKIN
Date and time of appearance :
13/06/2021 18:37:49

id :03
name :JACOB TREMBLAY
Date and time of appearance :
13/06/2021 18:38:58

id :04
name :NEEL SETHI
Date and time of appearance :
13/06/2021 18:50:14
```

Figure 3.41: the attendants list in the mobile application interface.

If we press the button **Send Notifications**, toast message appears if the notifications are sent successfully.

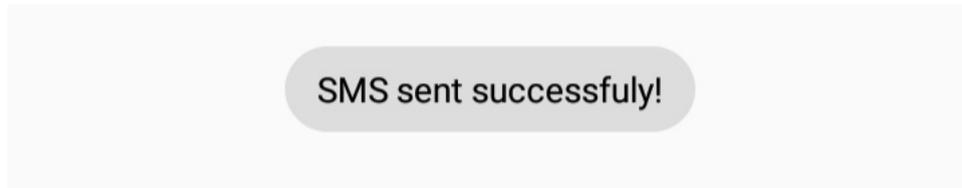


Figure 3.42: Messages sent successfully Toast message.

To confirm that notifications are sent to the parents, these are screenshots from their phones (see figure 3.43).

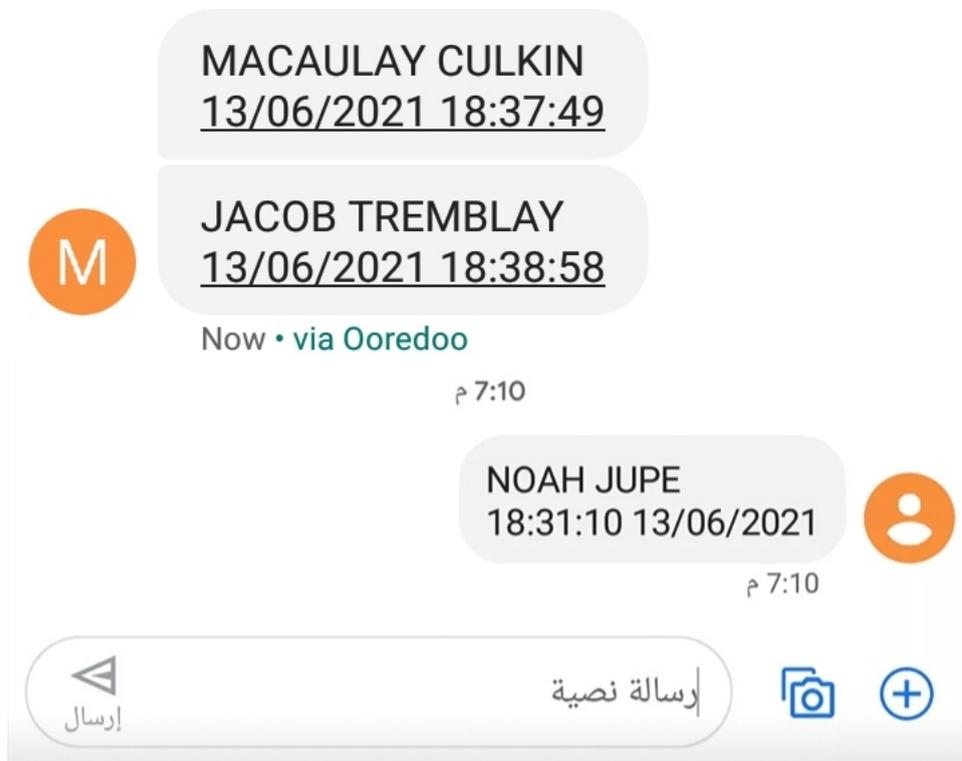


Figure 3.43: Notification deliverance.

3.4 Conclusion

This project aims to develop a control system for children entering / leaving school. The developed system successfully follow the children's process in different time. The, connecting via mobile application, it notify parents if there is an attendance and provide the date and time of the appearance.

Overall, the system developed offers fast and easy control of school dropout and ensuring the presence children is continuously maintained.

General Conclusion

Abu Huraira (Allah be pleased with him) reported Allah's Messenger (peace be upon him) as saying: "When a man dies, his acts come to an end, but three, recurring charity, or knowledge (by which people) benefit, or a pious son, who prays for him (for the deceased)
Sahih Muslim 1631

ONE problem many schools continually struggle with is proper access control for visitors. By implementing school security cameras at entrance doors, it can help the administrative staff monitor visitors and make sure they are properly signed in, while still allowing the pupils to move freely around the campus.

School Surveillance Cameras is the most preferable action that can be taken for parental control. Cameras mounted near main entrances and in administrative offices can help to record each visitor as they enter and exit the school. Cameras near exits can also help reduce truancy.

Also, school surveillance cameras can protect from vandalism, While school surveillance cameras are generally beneficial, systems are constantly under risk of vandalism/breaking. Cameras do not guarantee security and cannot be seen as a fail-safe. staff should remain diligent of their security and act responsibly during an emergency[26].

The software exhaustively examine and analyze the cases that the system could vary its current state to. The notification would be textual and sent from the administration.

Future work

As prospects for our work, we propose to improve it by future work in order to obtain more efficient analysis. These future updated works are as follows:

1. Providing the parents with the school schedule to track the movement of their children.
2. The parent send notification to the administration about the absence / lateness justification or advanced information about the child attendance in order to be exempted from the administration's notification.
3. Making the parent choose the communication (email or SMS), and send visual feeds mutually from both administration and parents (if possible) to each other.
4. Using different measurements to improve the accuracy of the facial recognition, like increasing the amount of the training images set, or use light motion sensor in the surveillance camera.

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