**Project Report**

**Course:** Mobile App Development

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**Title:** Smart Alarm System

**Introduction**

**Goal**

* **What are we trying to do?**

We are trying to make a smart alarm application build in android studio using machine learning kit of prebuild model with some algorithms for object detection. We are building this application for the people who are struggling to get up especially in the morning. They faced problems getting off the bed and this our application will make them get off the bed. The first part of the application work similar to any other alarm application where a use can set up an alarm for a specific time in the future and once the time approached, the alarm will start buzzing and playing the tone in order to wake the person up, but usually some of us just stop the alarm and are too lazy to get off and instead of waking up they sleeps again. Here our app will help or in a more sophisticated term will force them get off the bed. When the use presses the stop button to close the alarm, our app will ask the use to take the picture of a randomly used object and upload it into the app. Then the app will recognize that specific object using machine learning algorithms designed for that and once that object is detected on the image input by the user, they application will stop the alarm, otherwise it will not stop until the user upload that image. That the whole gist of the of what we are trying to do in our project.

* Who would benefit from this application?

Since the target user of this application are those people who finds it hard to get off the bed usually in the mornings indeed of the alarm going off. These specific users are those who just press the stop button once the alarm start buzzing and then go to sleep again. So, we have created this app (Smart Alarm System) for specifically for this type of people and our application will make them get off the bed in order to stop the alarm, otherwise the alarm will never go off.

**Previous Work**

* **What related works has been done?**

We can find a lot of android based mobile application which are already in the market and some are just custom build which comes pre-installed which come prebuild with the mobile phone. We also found a lot of online code repositories and videos demonstrating how to build a simple alarm system, and contemporarily, find a lot of machine learning code for face detection or object detection algorithms code in the internet. But the main thing here is to combine them together, which would be a new thing someone would try to do and is quite hard for us keeping in mind out limited understanding of this specific field of mobile application development in android.

* **Did the previous work succeeded or failed?**

This specific domain of android mobile application development is emerging day by day and a lot of advancement can be seen in every work come to the market. At the same time the Machine Learning part of this application is quite efficient and the algorithms used in the detection of the objects are equip with different algorithms out of which one of the prominent one the convolutional neural network, which is the composition of different neurons to extract the main features of every image during the training process and later use that features to distinguish between different images. So, most of the work present in the market whether they are alarm application or Machine Learning application are quite successful and famous, but our idea is quite different and unique in a sense that we are trying to combine the two things together, which I doubt has never been done before by anyone. So, our application would be the pioneer of such kind of application and it will decide whether it will become a failure or triumph to be first one of its own kind.

**Approaches:**

* **What approaches did we try?**

Since our smart alarm system would not be an ordinary one like the customs build app we usually find in our mobile phones. The best thing about this app would be its machine learning part of object detection with it. The whole project process is described in the following steps:

1. Once the user installs the app in the phone, he will be asked to set the timer to wake him/her up in the morning.
2. When the time approaches in the morning the alarms will start buzzing with a tone choose by user’s choice.
3. There will be two buttons, one is to stop the alarm and the other is to snooze the alarm for at least five to ten minutes.
4. When the user clicks on the stop button, the camera will open and will demand from the user to take a picture of random choose pre input image. These images will be from the things that we usually use during morning which include toothbrush, toothpaste, toilet seat, water basin. Once the user clicks the photo the app will recognize the photo using the object recognition system and then, the alarm will stop making the person getting off the bed.
5. Each time, through a randomizer, the app will demand different image form the user and the alarm will not stop at all cost until the user take the picture of the object the app demands. One cannot upload a photo from the gallery, rather the user can only use the camera to take the picture.

* **Under what circumstance do we think it should work better?**

First of all speaking of the technical part, the device needs to be equip with the latest version of the android version and the devices having android api version less than 29 would not work as the some of the part of machine learning and the notification generator needs to have this condition met in order to work properly. Before that the main part of our job is to connect the two part together .i.e. the part of machine learning for object detection purpose to the part of alarm manager, as it was creating some problems at the beginning. If these things are done and working well and then, there won’t be any problems building and using the application. Moreover, the machine learning part is a bit tricky as the accuracy of the algorithms is not 100% percent accurate and it is possible that sometime the algorithms will fail to detect the object. So, we need to make the algorithm efficient by training it with sufficient data set to restrict such thing from happening. So, if all the problems and things mentioned above, if those conditions are met and the error are confined, then the application will work properly without having any difficulty.

* **Why do we think it will work better under those circumstances?**

Since, most of the things mentioned above are the errors and deformities which could happen while implementing the application of smart alarm system. So, if all those things are avoided and the application runs smoothly, then both the developer and the user will be happy. As we know that this is the initial step and once, we deploy it, it will surely throw some error or some bugs might show up, which will be correct based on the context and further review.

**Methodology:**

1. Front-end part: In the front-end part we don’t need much fancy interface of the complex application, rather we just need a simple application for the ease of users. An interface needs to be build where a user to set up a timer from the alarm and once the alarm time approaches, a notification bar open to show the user about the time set for alarm and when the user clicks the stop button, we need an interface for the camera to open for the sake of detecting the object propose by the application, identify the object and finally will close the application when the desired object is detected.
2. Back-end part: the back-end part is mostly comprised of the machine learning algorithms and all the dataset it needs for training purpose. Then we need some other dataset to calculate the accuracy of the model as per the testing dataset. The machine learning model need complex algorithms to be trained and it consist to neural network to extract the features of the images for detection purposes. So, mostly the back-end part is consisting of the machine learning part, and the alarm choosing part was quite simple to construct. It just needs a simple alarm picker and then some channels to show the notification once the time approaches based on the selected time by the user. Then, there is a need of a bridge between the time picker and the machine learning part, which presumably is the part of opening the camera for the sake of taking picture of the object randomly chosen by the application. Once, the machine learning recognizes the image, upon then the alarm will come to stop.

Initially we proposed to use the firebase Machine Learning kit in the part of detecting the objects, but once the project progressed, we realized that it was a bit harder than we presumed. As it was our first time building an application of such scale and so many things were new to us. So, we looked for the alternatives and found some of the already pre-build open source machine learning kit which we need to modify based on our project requirement.

We divided the certain task among the group members, as one group member was working on the front-end part of making simple alarm application with a notification, and the other two were working on the machine learning part, which was a bit complex and need some research work, so that is why two group members were working on that part. The first part was made with a simple android time picker which the user will use to choose his/her desired time to set the alarm. Once, the user set the alarm, it will start the counter and upon arrival of the time set by the user, it will show up a notification that the time has appeared. So, then there is already a cancel button to close the alarm and when the user press that cancel button the camera is going to open and will ask the user to take the picture of a specific regular use object which we usually find in out apartment which can be either tooth brush, any chair in the house, or a toilet seat, .etc. So, when the user takes the photo of that specific object, the machine learning part will recognize the object, as we have trained the model before with the help of sufficient training dataset, and then the alarm will stop. Other than that, the use will not be able to stop the alarm and if the user fails to take the picture of that specific object, it will ask the user to take the picture of another object, in case that object is not present in the house at that moment. So, that the whole idea of the project and this is just the beginning and we will try to build to further if we will succeed in this part of the project.

**Results:**

We will test the application on an android phone and emulator to check whether it is working or not. The application will be considered completed when a user successfully set an alarm remainder and the app work properly by opening the camera when the stop button is pressed and successfully recognize the object it asked for and then stop. Our goal is set to completed when it helps the user to get off the bed especially in the morning as the app focus only the people who struggles while getting up in the morning.

**Discussion:**

**Discussion 1.1**

**User Interface**

The User interface is relatively simple compared to majority of the alarm clocks that are in the market. It is explained by several reasons. First, since this app has a built-in feature of image processing and object detection, it was rational to keep the UI simpler due to memory and hardware limitations. Second, it is more user-friendly. Considering the fact that its primary goal is to aid people who struggle to get up in the morning, it is best to keep it as simple as possible.

**Discussion 1.2**

**Limitations**

There were several limitations we had faced while producing, compiling and researching to make the app functional. First and foremost, there was a little data in the topic we were trying to handle. Since most of the people find other languages more appropriate to use Python, MATLAB etc. for data processing processes, it was challenging to find the proper source to use as a reference point in generating the code. Second, since the Android Studio keeps updating on a frequent basis, it was hard to fit the existing code to our version in terms of the syntax. Finally, compilation of the different segments that were designed by three of us individually, it came out difficult to combine the code that used different approaches and syntax. However, overcoming the challenges we found out ways of cooperating and combining different work-styles to produce a final project.

**Discussion 1.3**

**Methodology**

In terms of the code, we mostly referred to the <https://developer.android.com/studio> site. We have been able to incorporate almost all the topics covered in the Mobile Development Course as well as the different project management tools and methodologies came in handy. First, we found that the Waterfall methodology would help us to reach the target efficiently, however later we realized Waterfall lacked the flexibility to work upon the project. Since the topics were covered gradually, we could not move with the initial plan of first setting up UI, then proceed to backend part. That is why we found Agile methodology helpful as it we could set the sprints and track our process gradually. Another aspect that helped us to finish successfully was the GitHub platform that allowed to work on the project efficiently.

**Conclusion:**

**Summary:**

In this project we are developing an app for the people who are always find it hard to get up in the mooring. In the project we are using firebase machine learning with the simple alarm app so that when the user trying to stop the alarm, it will ask from the user to take the picture of random image which we usually use in the morning. That is how it will force the use to get off the bed. By the end of this project, we will be able to know how to create a simple application and especially how to make it work in the backend with simple database and contemporarily use firebase machine learning with the application. Since, now a days we are totally depended on the technology and simple application like these to help to live along.