Hanyang University
Introduction to Intelligent Robot Control

Antoine Li - 9169920227
Nicolai Kowol - 9175720225
Vivian Garcia - 919992022

Project Lit Review

In order to improve our prototype, we researched similar projects or research that could help us improve our own idea.

We have selected 9 different articles that contain relevant information about our prototype idea or interesting studies in a field related to our prototype.

The goal of this document is to think outside the box, deepen our understanding in different areas, and find new ideas or other ways to further improve our project without making the same mistakes as others.

Each member of our team searched for three papers, studies or anything else which met the requirements described above and extracted the basic ideas of the text as well as how they relate to our prototype.

Wake-up robot nudges an object in contact with a person to wake him up

https://dl.acm.org/doi/pdf/10.1145/3029798.3038349?casa_token=Txlc-vbAI-8AAAAA:OhMxS0fZXD9sjnpC6uaYJSo6PG1_PYuio_F6JARVd7EImU9_Rl5jQ7GmzDIDhxEP5H3Wn4wIh-saKXc

We can see thanks to this study that thanks to simple functionality we have good results to wake someone up so with our technical means and our capacities we can develop the function of awakening. In this study the proposed robot nudges an object in contact with a person (in this case, a bed) to deliver urgent notifications. And they calculated how much time it takes to wake-up the person. So this study showed us that it would be very efficient to develop a simple functionality to do an alarm robot with an arduino project.

Smart home robot

https://downloads.hindawi.com/journals/misy/2021/5511546.pdf

This study is about a general smart robot for home but it also speaks about the efficiency of a robot for robotic assistant in the project that interacts with the child and provides necessary companionship (supervision and guidance).

This system is a smart home service robot system based on ROS, which can help people manage and control household appliances, which brings convenience to people. Its voice recognition function makes the communication between the owner, and it simple and convenient. Currently, smart home service robots have fewer functions, and it is difficult to meet people's needs for a comfortable, convenient, safe, and fun home life in this article.

Can social robots help children in healthcare contexts? A scoping review

https://link.springer.com/article/10.1007/s11948-015-9649-x

This study is very complete and speaks about different studies about the healthcare of children with robots. It synthesizes several studies and makes conclusions about the efficiency of robots in different fields.

We can learn some specific aspect of children/robot interaction efficiency like:

1. Hospitalized children who interacted with a robot together with their parents demonstrated greater decreases in pain and anxiety compared with those who interacted with the robot alone.

2. Most publications reported positive outcomes, including generally high acceptance and liking by children, parents, medical staff, teachers and bystanders. However, these results should be treated cautiously given the predominance of subjective and qualitative data

3. The designs of robots are quite important because they show a better efficiency about the interaction with the child.

Analysis of a Wake-Up Task-Based Mobile Alarm App

https://www.mdpi.com/2076-3417/10/11/3993/htm

For this study, an alarm app was specially developed where the user can deactivate the alarm in various ways. These include pressing a button, solving a math puzzle, shaking the smartphone, and snapping a picture. The app was released and the user data, which has been accumulated, was analyzed.

It was found that pressing a button was by far the most popular way for users to deactivate the alarm clock. It was also found that users prefer cognitive tasks to physical ones. Even if they take the same amount of time to solve them. In the study, this was explained by psychological stress, which occurs more strongly when the user knows he has to absolve physical tasks.

The more stress that occurred when solving the task, the more likely it was to be used to get up early.

From this study, we can gain important insights for our prototype. For example, as the morning progresses, we can lower the task difficulty or shift from physical to cognitive tasks. Also, we could allow users to indicate the 'importance' of getting up in order to infer the difficulty of their task.

For example, early in the morning, the prototype would present hard tasks such as a small but challenging game on the robot screen or a quick physical exercise. Later in the morning, the prototype could switch to less cognitively/physically demanding challenges (i.e. the button).

The Effectiveness of Different Alarms in Waking Sleeping Children

The study is concerned with the reaction of children to various fire alarms when they sound in the middle of the night. In addition to the standard model (high-frequency) and a low-frequency model, the voices of the mother and a stranger are used as alarms. The results show that with the standard model only about half of the children wake up, while with both the low-frequency model and the two voices almost all children wake up.

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This study could help us to find the right approach on how to wake up children. Instead of using a high-pitched alarm, the voice of a person (e.g. the children's mother) could be used to wake the children

Road Network-Aware Spatial Alarms

In this project they design and develop a road network-aware spatial alarm processing system, called ROADALARM with the following features
-They use sing a star-like subgraph with an alarm target as the center of the star and border points as the scope of the alarm region.
-They describe a baseline approach for spatial alarm processing by exploiting two types of filters
-They develop a suite of optimization techniques using motion-aware filters
Their results shows that the road network-aware spatial alarm processing significantly outperforms existing Euclidean space-based approaches.

We can relate this to our project by using the spatial alarm to know if our users are still in bed , maybe the alarm can stop when the users go to the bathroom to get ready or go to the kitchen to get food or just by stand up .

This paper talks about a new topic

Microcontroller-Based Alarm Clock System with Sensor Pad Circuit

In this study they tested an alarm clock capable of determining whether or not the user is in bed by integrating a sensor pad to detect the subject, they also implemented a time in which the alarm would sound every 2-5 minutes to wake up those in deep sleep and finally the snooze function was removed so the only way to turn off the alarm is by getting out of bed , the testing was significant and successful with 95% of confidence level.
This relates to our project by giving us another option to improve our prototype and maybe including a sensor pad that can feel when the kid is in the bed or not.

Hands Reaching Out of Dreamland: A Haptic Peripheral Alarm Clock

In this paper, a haptic peripheral alarm prototype is built. That is, this is an alarm clock where you can feel the time until it rings. For this purpose, a wooden block was used, which disappears into the alarm clock's housing as the time progresses.
This alarm clock is intended to help make reading the alarm clock a haptic experience and thus stimulate other brain regions.
We could use this idea as an incentive to make our alarm clock more peripheral as well, or possibly to appeal to other senses besides hearing and seeing. For example, the prototype could spray the smell of coffee or freshly mowed lawn at a certain time. This could lead to a less stressful wake-up for the user.

The importance of analogue zeitgebers to reduce digital addictive tendencies in the 21st century

This study investigates dependency tendencies on the Internet in connection with the use of analog watches or smartphones. Based on a survey conducted during the 'MS-Science' trade fair, increased dependency tendencies are recorded when the respondent uses his smartphone instead of analogue alarm clocks, pocket watches, etc. The study is based on the results of the survey. Among other things, this can lead to the person being distracted by other features or notifications while reading the time. This is only possible to a limited extent with analog watches (smartwatches excepted).
For our prototype, this means that it can lead to less dependence on the Internet for the respective user and could thus increase his (mental) health. For this, however, we would have to make sure that the prototype does not provide access to the Internet or too many features. The fewer features, the lower the probability that the user can be distracted.

Three Similar Robots

Alarmy – Joyful Alarm Clock
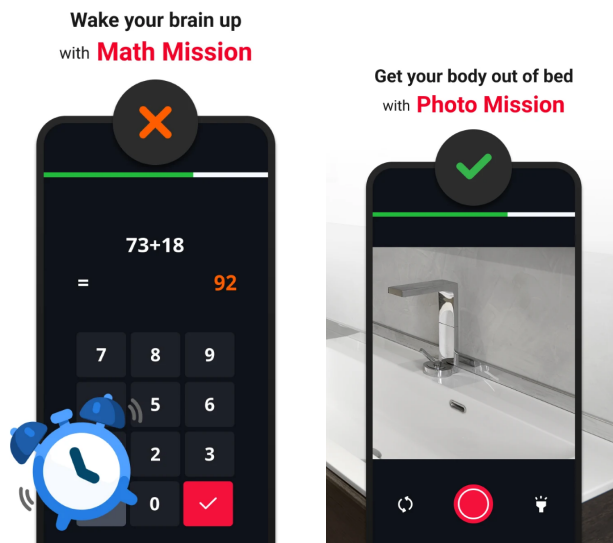
This is the app which was specifically programmed for the 'Analysis of a Wake-Up Task-Based Mobile Alarm App' study and which has currently around ten million downloads in the Google Appstore.

The user can decide between different ways of how to deactivate his alarm. He can solve a math problem, push a button or make a picture. Except this, it's a regular app for setting an alarm with the associated functions.

Wake up arm
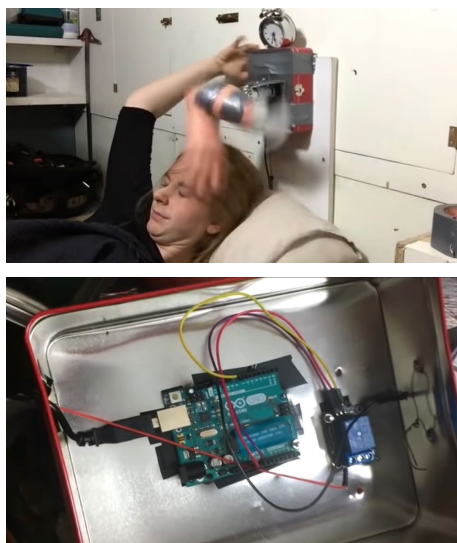
This robot is using an Arduino Uno to get the signal from the clock switch and then start a Dc motor to move the fake arm, basically what these robots do is slap on the user face until they turn off the clock.

Philips SmartSleep

This alarm clock wakes up the user with sunlight and natural wake-up sounds alone. Thus, this device focuses on the natural sleep rhythm of humans to make waking up more stress-free for the user.
Other features include a radio, an interactive display and a lamp.

Conclusion

During our research on Google Scholar, we noticed that there are not many robots that have been developed specifically as wake-up robots to meet the need for a device to wake up humans. There were many robots developed to study the efficiency of different methods for waking humans. But this is not a real answer to our questions.

We found many alarm clock robots made for other specific needs. Indeed, the efficiency of robots to wake-up or to help children was studied a lot and it showed good results. We also found some websites about alarm arduino tutorials. All of this input has forged our project further into the prototype we are planning to build: We want to create an alarm clock robot specifically made to wake-up children in a way more efficient and gentle for them.