

IoT Project X14378581

The Light Sleeper Proposal

Abstract

The Light Sleeper is an autonomous alarm system created for people that wake up groggy/tired or for the heavy sleepers. The app is designed so it will help the user wake up and feel like they have a proper night's rest and for the heavy sleeper, it will help them get in to a better sleep pattern allowing them to wake when they need to be. The light effect is researched to make you feel better about getting up and to imitate the sun shining on your face.

Introduction & Description

The Light Sleeper is an autonomous alarm system designed to provide autonomous assistance to people who struggle with rising in the morning or find themselves hitting their snooze button too often. The project area which this project falls under would be health and lifestyle. The projects system consists of an Android application, alarm clock, Raspberry-Pi, RGB led strip and RFID tag/reader.

The user inputs the time they would prefer to wake up and suggestions are made to the user for times to go to sleep which will help improve their sleep cycle and give themselves a better start to the morning. This will help the users sleeping pattern, while getting the optimal amount of sleep to provide the benefits of rest and waking up.

There will be two raspberry pi's with one downstairs preferably in the kitchen acting as a docking station and the second being in the user's room. The first raspberry pi will have the RFID reader connected and the user will have the tag on a bracelet which they will physically have to bring down in order to switch the alarm off. The pi's will be connected through python with a receiver and sender, allowing the docking station to inform the alarm to switch off. The second raspberry pi will have the actuators such as the buzzer and the RGB light which the pi will activate once the alarm is set.

The alarm is set in the app and they are connected through AWS to set up the clock and alarm information on the raspberry pi. The buzzer will activate for roughly 10-20 seconds to get the users attention and then the light will gradually turn on getting brighter until it is switched off. The user will have a certain amount of control over the



light and how bright it gets, or the colours used which can be controlled in the app. An LCD screen will also display the time and date for the user setup on the app.

It has been proven by having a sleeping routine i.e going to sleep at a designated time and waking up at a designated time, that this will greatly improve your sleep pattern. This allows people to wake up feeling refreshed, and for heavier sleepers, it will allow them to feel rejuvenated throughout their working day. The reason behind this is, sleep cycles which typically last up to 90 minutes, during which time your brain will experience five different stages in the sleep cycle. The last stage of each sleep cycle is rapid eye movement (REM) and this is the state where people dream, but if woken during this state, they will be groggy and disorientated. This shows if people make the effort to improve their sleep pattern, mornings will be something they can look forward too.

The following is the reasons for using an RGB light as an alarm rather than a buzzer. Our bodies produce a hormone called melatonin before sleep to make people tired. This is also why people find it can be more difficult when waking in the winter as it would usually still be dark out. When the sun rises, the body stops producing this hormone and will begin producing serotonin also known as the happy hormone. The process is called "dim light melatonin onset" (Harteveld, 2013) . This means that not only will an RGB light be more efficient as an alarm, to assist people in waking up, it will make them feel better about themselves.

Objectives

An alarm clock will be configured by the user through an app using AWS to set a time, when the alarm goes off, a light sensor/buzzer will be triggered with python.

Utilize two Raspberry Pi devices, one which is a docking station with a RFID reader and the second which will act as the alarm clock.

Configure a receiver that uses the information from device use, such as when the user sets a time, appropriate information should then be provided based on their selection to help their sleep cycle.

Evaluation

Discuss how progress will be evaluated throughout and at the end of the project.

- The first object of this project is to get the basis of the project or its core structure complete. This will be accomplished through connecting the app to the raspberry pi which will be in the user's room and having the capabilities to activate the alarm which will switch the RGB lights and buzzer on.
- The next objective is to connect the docking station to the second raspberry pi. This will give the user the capability to switch the alarm off once its activated through the RFID on their bracelet.

- Following that will be the information to help the users sleep cycle. So, when the user inserts the time they wish to wake, they will be shown the appropriate times to fall asleep to assure the best sleep pattern.
- If all is finished on time, there will also be different versions or settings for the buzzer and light combination such as the light flashing or acting as the sun rising and gradually getting brighter and brighter while you can set the buzzer to go off at different times or snooze it for a certain length of time.

Formulate clear indicators for each objective and result.

- So, for my first objective which involves the two-raspberry pi's, they will both constantly be activated allowing the user to use them anytime and once the users phone has Wi-Fi they will be capable of setting the alarm from anywhere. The docking station will just be the raspberry pi plus the RFID reader in box to hide the equipment and give the user a clear and precise area they must put their RFID tag too.
- The raspberry pi will be placed near the user's bed allowing the RGB lights and buzzer to be close enough to the user to be efficient. They will be placed in a container to better their performance such as make sure the light is reflected in the user's direction or if capable have lights on either side of the user.
- The app will be available to android users being created on android studios. It will allow the user to set the clock and date which will be seen on the LCD screen. It will be placed in the container allowing it to be seen easily by the user from their bed. They can also set their alarm clock. When the alarm activates, depending on the settings the user has set, the default will be the buzzer sounding for 10-15 seconds and at the same time the RGB lights switching on at a low brightness setting and as time goes on, it gradually gets brighter and brighter.
- The final piece is the information available to the user to help their sleep cycles. When the user sets the time for their alarm, they will be notified of extra information as to when to go to sleep in order to benefit most for when waking up at that time. It also means you are much more likely to wake up more refreshed giving you more of a reason to improve your sleep pattern.

Indicate how and when to conduct monitoring and evaluation activities to determine project's progress and outcome.

- After each objective has been completed I will run tests to evaluate if the objective has been completed to its full extent. For the first objective, tests will be run to ensure the app is connected properly to the raspberry pi and that all its functions are fully operable such as the RGB changing for the different settings it will have. This includes the buzzer working on different patterns that the user wants it to.
- The second objective, to determine it is fully functional, tests will be performed to ensure the RFID tag and reader work before even connecting it to the other raspberry pi. The next step will be to get a message on the second raspberry pi from the docking

station when the RFID tag is scanned by the RFID reader. Then the alarm will be added so when the tag is recognised the alarm will switch off.

- So, for the last objective the first part will be connecting the database to the app. It will be tested to ensure that the app can read from the database first. Then the database will be configured in such a way that if the user inputs a certain time, they will be given the corresponding times to help their sleep cycle. This will be tested by inserting a number into a readable line which is sent to the database and grabs the information from a table with the same number as its heading.

State which methods will be used to monitor and evaluate the project.

- The main items that would need to be monitored is first, the connection from the docking station to the second raspberry pi. If the second raspberry pi can't receive any information from the docking station, it will notify the user through the app, so they know that the alarm may still be active.

- The second being error handling between the app and raspberry pi when communicating. The user will need to know that the raspberry pi doesn't have the appropriate information that has been inputted such as settings for the RGB light and buzzer. It would also include the information on the time for the LCD screen and the alarm clock itself. It will notify the user on what the problem is such as if the raspberry pi doesn't have a connection or if AWS is unavailable. They will also be told if it hasn't gone through from an error with the app.

- The third being the error handling between the database and app for when the user is setting their alarm clock. It will let them know if AWS is down or if there is an error with the database as they can become unavailable sometimes. It will let them know if an error with the app has also happened with either having no signal or that the job its trying to accomplish needs to be repeated. It will also let them know if that particular request isn't in the database yet or that data is missing.

References

(Anon., 2018)

(Anon., 2018)

(Harteveld, 2013)

(Scammell, 2007)