
Senior Design 1

Initial Project Document

Snoozie Smart Pillow



The University of Central Florida
College of Computer Engineering
Dr. Samuel Richie
Dr. Lei Wei

Group 46:

Jason Davis	CpE	jcdavis2020@knights.ucf.edu
David Kipikash	CpE	kipikash@knights.ucf.edu
Kevin Perez	CpE	kevinperez@knights.ucf.edu
Christian Tomlinson	CpE	Ctomlinson8@knights.ucf.edu

Section 1: Project Narrative

Introduction

Technology today is a very important part of our lives during our waking hours and has improved our lives many times over. With that said, our project, the Snoozie, aims to use the same technology that improves our lives when we are awake, to improve the time that we spend asleep. Sleep in humans is a vital part of a person's health and the average person will spend 1/3 of their lives asleep, and we think that our project, the Snoozie, can use its multitude of features to make the time before, during, and after sleep a more enjoyable experience.

With that said, the main goal for this project, the Snoozie, is to make a comfortable, affordable, and durable product that a customer can use to make the time spent in bed more functional, more comfortable, and overall a vastly improved experience that one would have rather than using a typical pillow that is widely available today. In order to achieve this goal, we will utilize many features that will be on the physical pillow, along with an intuitive app that will sync with the pillow to help navigate and employ the various processes and features that the smart pillow can do.

Project goals and objectives

For our team to build the Snoozie, we will need to have some goals and objectives that we will need to set so that we can make a good product that will be able to meet the customers needs. Our main goals and objectives for what we want to do with the Snoozie are to:

1. Provide the user with a comfortable sleeping solution
2. Improve the time spent before and after sleeping
3. Track and improve the sleeping patterns of the user

We want our user to be able to enjoy using the pillow, so we will need to make the pillow comfortable to use which is one of our goals that we have listed. This is probably the biggest concern that we have because at its foundation it is a pillow, and the first thing a person will notice is how comfortable it is to sleep on. If the pillow is not comfortable, it will immediately turn the customer away from using our product.

The next goal for our project is important for the time that is spent before and after you are in a deep sleep. We want to make sure that the pillow has functions that

the user can use to put them to sleep, and make sure they wake up in the morning in a healthy manner.

The final goal we have for the project is to be able to use the app to track and improve the sleeping patterns of the user. It is important to get a good rest and many factors while sleeping can affect the quality of sleep you are getting, so we want to track things like light, sound, and movement to help the user achieve the best quality sleep that they can get.

Overall, our goal for the Snoozie is to have a better sleep, and we will use the many features in the software and hardware of our product to provide the user with that amazing sleep that all people need to have a productive day.

Project Features

As stated above, one of the main concerns that people might have with a smart pillow is how comfortable it is to sleep on, and that is a totally valid concern with all the parts and electronics that will be inside the pillow. The Snoozie will have all the electronics held sleekly within the pillow and surrounded by a firm memory foam that will stop the electronics from being felt by the user. This will solve the problem of the electronics being felt, but that does not necessarily mean that it will be comfortable to sleep on; to solve this issue, we will have inserts that the user can put in the pillows that will allow the user to change how firm or soft the pillow will be and adjust the thickness of the pillow to the user liking. Many high-end pillows found on the sleep foundation website such as the Brookline Down Pillow allow for the buyer to choose what firmness they want in a pillow, and we want the customer to be able to do this, and even change it whenever they want to. This should solve the issue of comfort for the pillow, regardless of how soft/ firm the user wants the pillow, or however the user would like to use the pillow for sleep. This is the foundation of a good pillow, but now we can build off of this to provide the user with an even better experience that will put our product over all other pillows on the market today.

As for the added functions of the Snoozie, we plan to put many features that improve the quality of sleep such as a sleep wellness tracker. A good night's rest is extremely important for a person to remain awake and alert during the day and the in-app sleep wellness tracker will aid the user in getting those valuable eight hours of rest. The sleep wellness tracker will be a part of the app that will connect to the pillow and will track the sleeping patterns of the user using motion sensors, a light sensor, and a microphone built into the hardware of the pillow. The pillow will track movement, light

levels, and sound to see when the user is in REM sleep, how well the user is sleeping, and if the user is snoring or has sleep apnea. Once the pillow has taken all the information it will use a machine learning algorithm to tell the user how they can improve their sleeping habits, and the health benefits to changing their sleep habits. Along with that, the pillow will utilize speakers and vibrations in the pillow to allow the user to set alarms, and the sleep tracker will work along with the set alarm to wake you up in a healthy, non-jarring way. The sleep tracking algorithm will also alert the user to when they should go to sleep to have a good amount of sleep through the app notification system. This system will not only provide the user with a comfortable pillow, but also with a way to improve their overall quality of sleep and improve their sleep health.

Another important feature of the Snoozie is the built-in speakers. Many people like to listen to music while they are in bed before they go to sleep, or even while they are sleeping. To meet these needs, we include built-in speakers that can connect to the app or act like a Bluetooth speaker. The speakers will also be able to connect to the app to make different preset sounds such as white noise, comforting rain, crashing waves, and smooth jazz. As said before, the speakers will also be used alongside a vibrating motor for the alarm to alert the user to wake up. To facilitate all of these features, the pillow will also include a side panel that will have auxiliary controls such as the power button, a volume control dial, Bluetooth pair button, and the charging port for power. These are all the features that we plan to add to the project, and we are trying to make the product as affordable as possible to compete with the market prices of pillows on the market.

All in all, the features that we plan to have included inside of the snoozie all point towards the user having a better experience in all things that involve a pillow. Many people might already use similar items that are included in the Snoozie, but we plan to bring all these items together into a smart convenient package that the user can easily use without needing to gather all the different items a person wants. We want it to be as convenient and intuitive as possible so the user can use all the features even when half asleep. With that said, we will have some challenges to overcome to make this product a reality.

Challenges

For us to make the Snoozie, we will need to overcome some challenges that will come up during the development phase of the project. With the electronics being located inside of the pillow, we will have some issues when it comes to the size of the

components. If the components are too big, it will affect the level of comfort that the user will experience. With that said, the electronics will also be heating up, so cooling will be an issue that will also affect comfort. Battery life will need to last for at least the night and batteries can get pretty large when we need to power components for a longer length of time. With all the features that we will be adding to the project, the components will need a large amount of processing power, especially the recording and sound, which is a large part of the Snoozie, so we will need to find an MCU that will be able to handle these very load intensive processes. Along with that, the MCU will need to be able to use bluetooth so that it can connect to the phone and send data to and from the app interface that we will be using. We also want to make sure that the customer will be getting a good deal for the product, and with all the parts and features it can become hard to keep it at a good price. We want to make sure that the Snoozie is as affordable as possible.

Marketing

When it comes to the market availability, there are some “smart” pillows that do only some of the features that we provide, but there are not many that have all the features that we have planned for our product. For the ones that do share a good portion of the functions of our project are priced very high ranging from \$200 - \$300, so one aspect that we will be focusing on is the affordability of the Snoozie so that we can give everyone a good quality sleep at a fair price. We also want to make sure that the app is as intuitive as possible, so that it is easy to use even while you are half asleep, which hopefully will be a common occurrence when using the product. Overall, we want the product to serve as a daily tool to assist in all things sleep related.

Section 2: Specifications

Hardware Specifications

ID	Priority (1-3)	Requirement Description	Test Description
001	1	The device's passive cooling will maintain the system at room temperature	Pillow's temperature will remain between 23C-30C
002	3	The device (and the electronics housed within it) will maintain a reasonable weight of around 5 pounds	When measured, the pillow should weigh between 5-8 pounds maximum
003	1	The device will contain a compact ambient light sensor for recording ambient light in the room	The ambient light sensor shall not occupy more than the space given within the memory foam, nor shall it weigh more than 10 grams
004	1	The device will contain a compact microphone for recording ambient noise in the room	The microphone shall not occupy more than the space given within the memory foam, nor shall it weigh more than 30 grams
005	1	The device will contain a compact accelerometer for recording motion during the night	The accelerometer shall not occupy more than the space given within the memory foam, nor shall it weigh more than 20 grams
006	1	The device will contain a compact thermal sensor for recording device temperatures and monitor overheating	The thermal sensor shall not occupy more than the space given within the memory foam, nor shall it weigh more than 10 grams
007	1	The bluetooth transceiver shall be able to connect with a mobile application	When connected through Bluetooth, the connection should be maintained until disabled.

008	3	The pillow will contain audio feedback capability. Output from 2 speakers in the pillow.	When device is connected to mobile app, user will be able to hear ambient noise in their environment through the pillow
009	1	The audio received from the external microphone will be transmitted to the app via bluetooth	Bluetooth transfer rate should be between 3Mbit/sec – 24Mbit/sec
010	1	The data received from the accelerometer will be transmitted to the app via bluetooth	Bluetooth transfer rate should be between 3Mbit/sec – 24Mbit/sec
011	1	The data received from the ambient light sensor will be transmitted to the app via bluetooth	Bluetooth transfer rate should be between 3Mbit/sec – 24Mbit/sec
012	2	The user will be able to increase the volume through “volume up” button on the outer control panel	When the button is pressed, volume should increase by one. When the button is held down, the volume will increase until it’s not being pressed.
013	2	The user will be able to decrease the volume through “volume down” button on the outer control panel	When the button is pressed, volume should decrease by one. When the button is held down, the volume will decrease until it’s not being pressed.
014	1	The user will be able to pair their bluetooth device using the “pairing” button on the outer control panel	When the bluetooth button is pressed for 3 seconds. Pairing mode shall activate and be recognized by the mobile device within 5 seconds.

015	1	The user will be able to power the device on and off using the “power” button on the outer control panel	Once the “power button” is installed with a cable (connected to two pins on the motherboard, the circuit being used should be closed on the motherboard. This has the power supply receive the signal that it should supply power
016	3	The user will be able to snooze their alarm by saying a keyword (i.e. “stop”)	The mic will listen for the trigger word while the alarm is going off and if the word is caught, it will shut off the alarm
017	3	If an alarm is going off, the user will be able to shake the device in order to snooze the alarm	The accelerometer will look for sharp movements while the alarm is going off and turn off the alarm when that happens
018	2	The pillow will be able to handle fall damage from a 4-foot drop off a bed	The pillow will have enough padding built in to it to be able to protect the electronics sufficiently
019	2	The pillow will be able to handle light water exposure (i.e. drool or a small spill)	The electronics will be placed inside the pillow enough to shield it from a fall. (note: the pillow will not be completely waterproof and will not be able to be submerged)
020	1	The pillow will be able to handle pressure from a user’s normal sleep patterns	The electronics will be encased inside of the foam and protected from normal patterns of sleep
021	2	The pillow will maintain about the same dimensions as a normal pillow (18” x 26”)	We will be able to fit all of the components and padding inside of the preferred dimensions by keeping the electronics compact
022	1	The height of the pillow shall remain under 7” to maintain comfort	We will design the components to be wider rather than taller to keep within these parameters
023	1	The device’s battery shall be able to last a full 12h before needing to be recharged	The battery will need to be able to last a full night’s sleep and some more

024	2	The device will implement a "power saving mode" that will allow it to save battery overnight, but disable some features	The user can either manually set the low power mode via app by setting a timer or immediately go into LPM. The pillow can also sense when the user is sleeping so it can trigger automatically.
025	1	The device will contain a bottom layer of memory foam to house and protect all the hardware components	The foam will be thick enough to prevent damage to the parts, but thin enough to keep within 7"
026	2	The device's more fragile hardware components will be housed in plastic casings within the memory foam	The case should not exceed 3.5"
027	2	The device's memory foam layer must remain smooth as to not impede the user's comfort	The user should not be able to feel the components and casing while using the pillow as intended
028	1	The device will house a microcontroller responsible for handling all inputs and outputs to the and from the device	The microcontroller should be able to connect to the app via bluetooth and communicate data to and from said app while handling the data from the components
029	1	The device will implement a compact, rechargeable power supply	The rechargeable battery will be able to comfortably fit within the pillow and not affect the user comfort
030	1	The device will be rechargeable through a usb-c port located on the side of the device	The pillow MCU will charge the battery, and when the battery is full be able to run off the wall power

Software Specifications

ID	Priority (1-3)	Requirement Description	Test Description
001	1	The application will provide users with a page where they can access and edit their alarms	When the user sets/modifies an alarm. The alarm will go off precisely at the time set.
002	1	The application will provide users with a page where they can track their sleep cycles ("Sleep Wellness")	When the users track their sleep cycle, the app will display the "sleep wellness" according to the data gathered from the sensors.
003	2	The application will provide users with a page where they can control their nighttime sound profile	The app will provide a selection of sounds/music the user can select. The audio should output through the pillow speakers successfully.
004	3	The "Sleep Wellness" page will provide users with a line graph showing audio interruptions over time throughout the night	The app shall gather data using the microphone module and send the data to the app to gather and display successfully.
005	3	The "Sleep Wellness" page will provide users with a line graph showing levels of ambient light recorded throughout the night	The app shall gather data using the transceiver and send the data to the app to gather and display successfully.
006	3	The "Sleep Wellness" page will provide users with a line graph labeling their sleep cycles throughout the night	Using the sensors, the pillow will track the user's sleep cycle through the night every day and display the data accordingly on the graph.
007	3	The "Sleep Wellness" will allow users to customize what	When the user selects the type of data they want displayed, the app will adjust accordingly and successfully display the

		information they want shown to them	information.
008	1	The application will be able to stream all audio of the connected device (similar to a generic bluetooth speaker)	When the smart pillow is connected through Bluetooth to the phone, the speakers should output any type of audio the user decides to play.
009	1	The application will provide users with the ability to control the volume of the device	Aside from being able to control volume from the panel, the user shall be able to control the volume using the phone's volume settings.
010	1	The application will provide users with the ability to set an alarm	When an alarm is set through the app, the alarm will sound at the time entered.
011	2	The application will provide users with a library of alarm pre-set alarm tones	When the user sets an alarm, the app will provide a selection of ringtones to use. When one of these ringtones is used, the alarm will play it at the alarm's time.
012	3	The application will allow users to upload custom alarm tones in the form of .mp3 files	If the user decides to have a custom ringtone. The app will allow a custom ringtone file that shall play correctly at the alarm's time.
013	3	The application will be able set alarm tones through the user's music library (i.e. Google Music, or Spotify)	If the user uses a song from a music app, the smart pillow app will adjust accordingly to output the custom sound.
014	2	The application will provide users will a library of preset nighttime sound profiles	The app will offer a selection of background (whitenoise) sounds to select. When one is selected. The app will output the sound through the pillow speakers.
015	3	The application will be able set a nighttime sound profile through the user's music	The user can select a background sound from any music app.. When one is selected. The app will

		library (i.e. Google Music, or Spotify)	output the sound through the pillow speakers
016	1	The application will use the audio received from the microphone to generate the user's sleep report	Throughout the night the microphone module will track sounds made (snore) and display the data in the app.
017	1	The application will use the data received from the ambient light sensor to generate the user's sleep report	Using the ambient light sensor, the data will be sent to the phone where it will display the user's sleep report successfully.
018	1	The application will use the data received from the accelerometer to generate the user's sleep report	Using the accelerometer sensor, the data will be sent to the phone where it will display the user's sleep report successfully.
019	2	The application will use the data received from the accelerometer to adjust the time to wake the user up	Using the data from the accelerometer, the app will learn the user's sleep cycles and adjust the time the user usually wakes up.
020	3	The user will be able to turn the device on and off using the application	The app will send an on/off signal to the MCU turning the device on or off
021	1	The user will be able to download the application on any Android-enabled device	The app should be made available through the app store
022	1	The application will use the data from the accelerometer and an algorithm to track the user's sleep cycles	The data will be received from the MCU and use it in the learning algorithm along with the other data
023	2	The user will be able to enable/disable "power saver mode" through the application	The app will send data to the MCU to tell it to turn off some of the components to make the battery last longer

Table of Constraints

ID	Difficulty (1-5)	Constraint Description	Solution
001	3	Temperature: It is important that we monitor the temperature as the device should be safe to use. Any heating issues not only can possibly damage the components but also bring harm to the user. Therefore, it is important to have the components protected and have a passive cooling system.	A solution for this would be to minimize the total power needed to run the components, this would reduce the heat output. Additionally, we can also customize the pillow to include small holes on the pillowcase that would increase the airflow between the components.
002	4	Durability: As the device is a pillow with components, keeping it safe from exterior damage such as from fall, liquids, or from simply moving it around.	Adding a thick memory foam that covers the electronics, reducing the damage from fall or water. Additionally, the pillow case can be water-proof to protect the electronics from any liquid damage.
003	3	Safety: It is important to guarantee the safety of the user when the pillow is in use.	Similar to the durability solution, the memory foam will protect the users from being in direct contact with the electronics. Additionally, it is important that the temperature is constantly tracked by the app. In case the temperature rises above a threshold, the app will automatically shut down the smart pillow.

004	2	Compatibility: Making sure the device can connect with ease to the phone app and will stay connected is another constraint as we must guarantee the effectiveness of the connection.	A solution to this is to have a strong signal with the transceiver module that can extend the connection's distance and strength.
005	3	Time Management: It is important we plan what we should do each week to maintain our schedule. If deadlines aren't being fulfilled, then our project can suffer significantly. This can impact major features this project has meant to have. Therefore, keeping track of our deadlines and fulfilling them is a high priority.	A solution for this is to constantly update out project milestones so that we know we have deadlines to fulfill. Additionally, we can apply the AGILE method to increase the effectiveness of our project design and implementation.
006	1	Cost: Given our limited budget we will have to think ahead about the components we are getting so that we do not go over the limit and we might need to adjust our requirements to fit the budget. It is important we are realistic with our set budget so that we don't expect to get better components that require a higher cost. Secondly, the set budget can change depending on the urgency or importance of a certain piece required for the project. This can greatly affect the overall cost.	A solution would be to plan the specific parts needed and set aside a certain amount that can be used if needed. This would allow us to be certain of the total amount of cost to expect.

House of Quality

Correlations	
Positive	+
Negative	-
No Correlation	

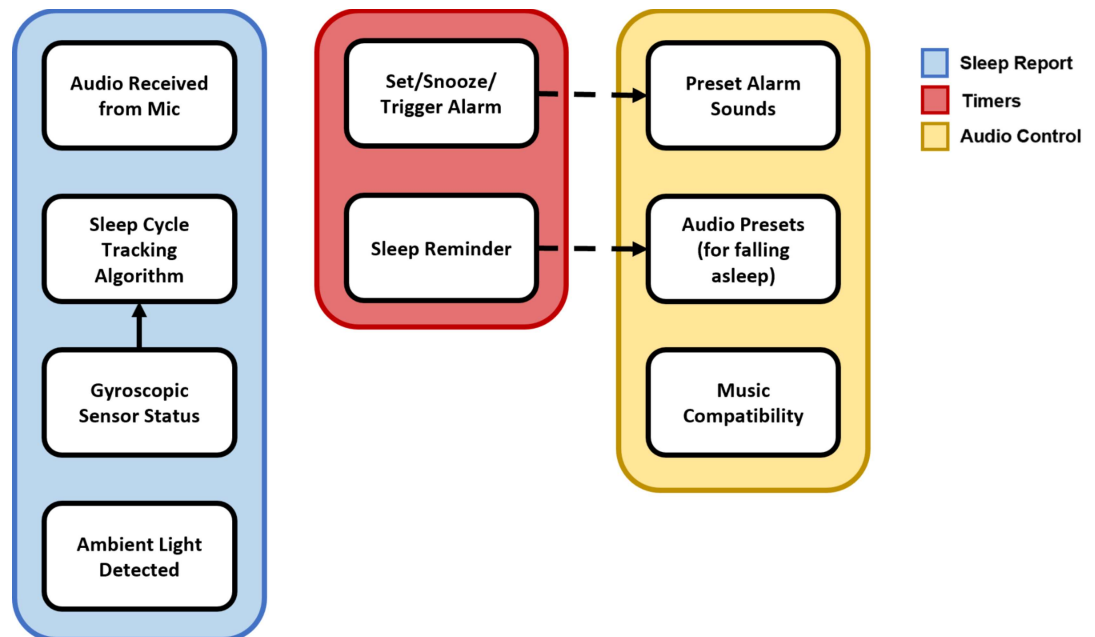
Relationships	
Strong	●
Moderate	○
Weak	▽

Direction of Improvement	
Maximize	▲
Target	◇
Minimize	▼

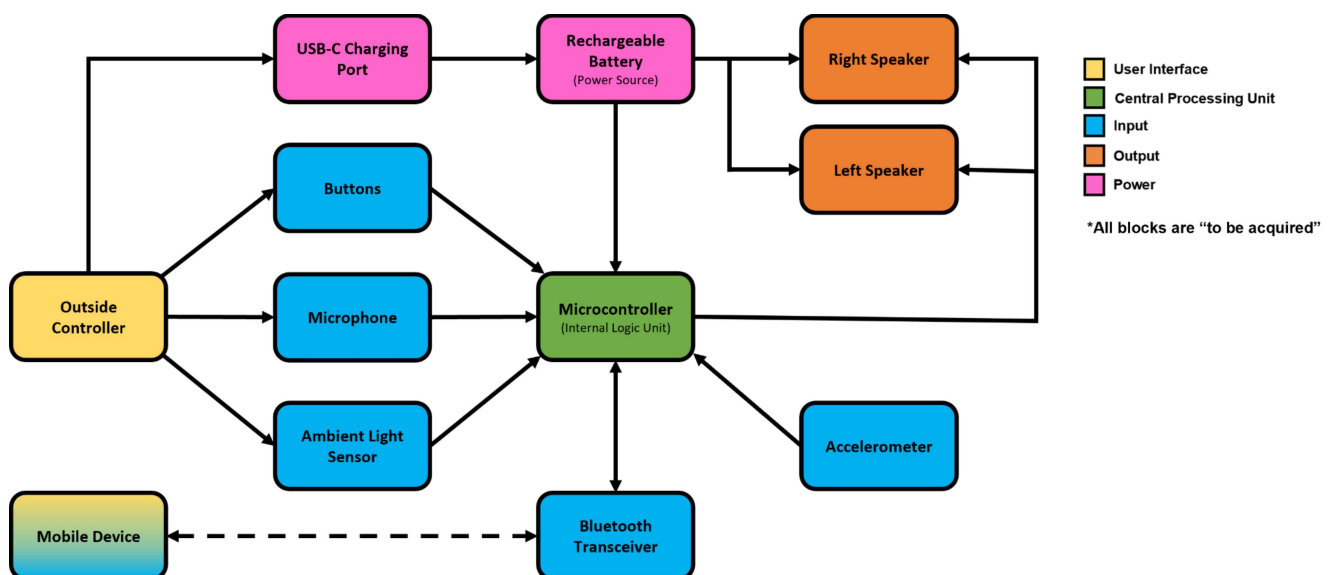
		<div><div><div>●</div><div>○</div><div>▽</div></div><div><div>▲</div><div>◇</div><div>▼</div></div></div>								
		Column #	1	2	3	4	5	6	7	8
		Direction of Improvement	▼	▼	▲	▲	▲	▲	▼	▲
Direction of Improvement	Engineering Requirements	Weight								
	Customer Requirements (Explicit and Implicit)	Dimensions								
		Power Output								
		Compatibility								
		Signal Strength								
		Sensor Accuracy								
		Temperature								
		Durability								
▼	Low Cost	○		●	▽	▽	▽		▽	
▲	Easy to Use				●			○		
▲	Easy to Install	●	●		●				○	
▼	Small Form Factor	●	●	▽				▽	▽	
▲	Long Battery Life	▽		●	○	▽	▽	●	●	
▲	Sleep Improvement				●			●	●	
Target		<= 5lbs	<= 20 inches by 30 inches	<= 10 Watts	Bluetooth + Wifi capabilities	5 meters - 10 meters	<= degrees error	23C to 30C	Function 100% all the time	

Section 3: Block Diagram

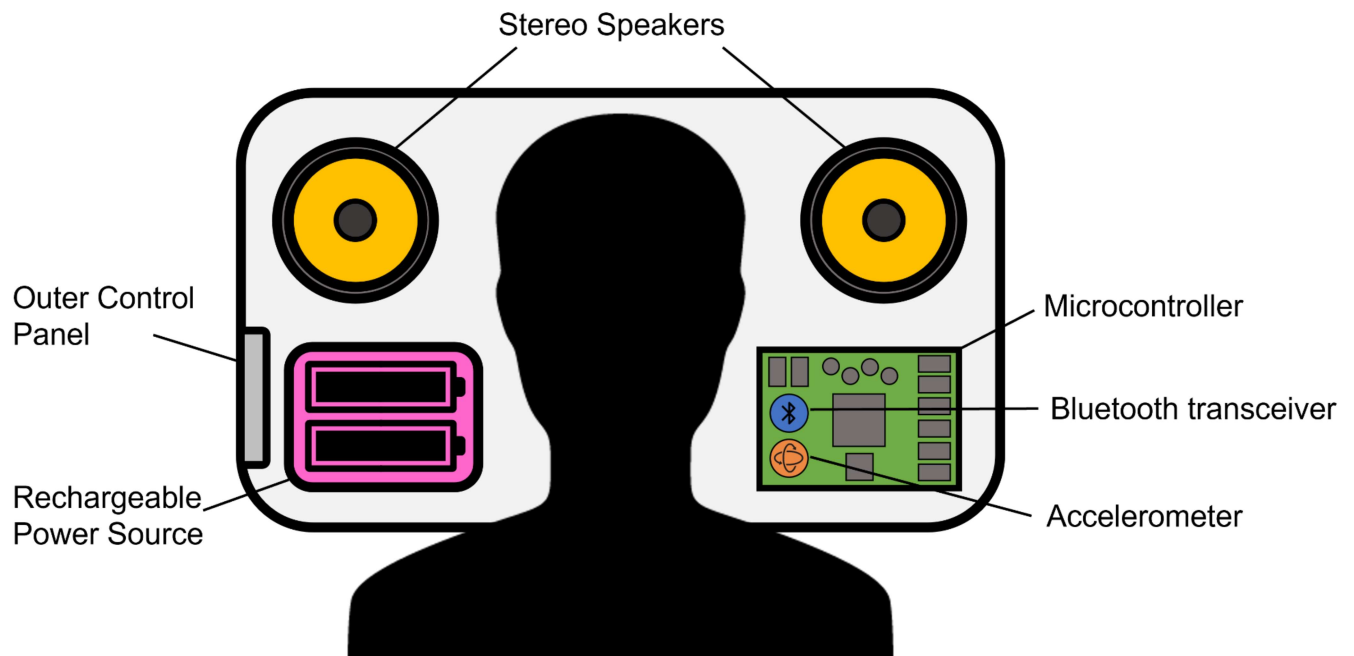
Software Diagram (by David Kipikash)



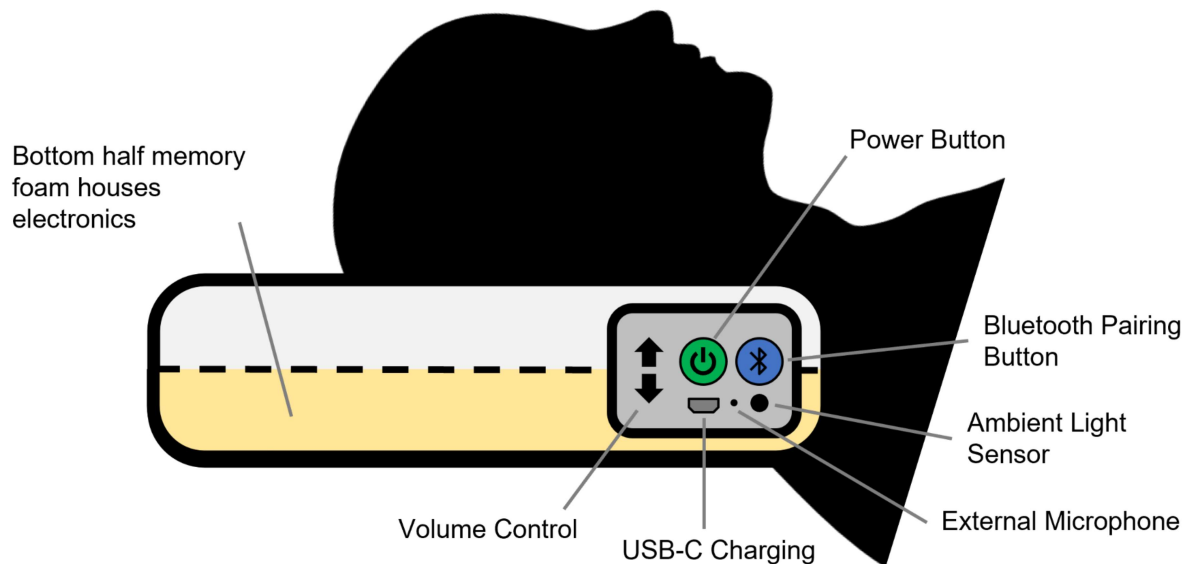
Hardware Diagram (by David Kipikash)



Prototype (Top-down view)



Prototype (Side view)



Section 4: Budgeting

Item	Price Estimate
Temperature Sensor	\$5-\$10
Accelerometer Sensor	\$5-\$20
Pressure Sensor	\$5-\$20
Wireless Transceiver	\$5-\$20
Memory foam	\$20-\$40
2AA Battery Holder	\$2-\$5
Pillow	\$10-\$40
PCB	\$80-\$120
Stereo Speakers	\$20-\$50
Ambient light sensor	\$5-\$10
Microphone Module	\$5-\$10
USB-C Charging Module	\$5-\$10
Volume Control Module	\$5-\$20
Total =	\$172-\$375

This project has a budget limit of \$500, it will be self-funded by the group members. The prices are estimates based on online research for the items listed. The price can vary depending on the number of parts we need but generally the prices are not expensive for each individual item. The price estimate will likely change as we continue to develop the project.

Section 5: Project Milestones

Milestone #	Deadline Name	Start Date	Deadline	Status of Deadline	Individual Responsible
	Senior Design 1				
1	SD Project Ideas	8/23/2021	8/27/2021	Completed	Group 46
2	Project Finalization	9/3/2021	9/9/2021	Completed	Group 46
	Main Project Document				
3	Initial Document - Divide and Conquer	9/7/2021	9/17/2021	In progress	Group 46
4	Updated Divide & Conquer Document	9/25/2021	10/1/2021		Group 46
5	Table of Contents	9/21/2021	10/19/2021	Unassigned	Group 46
6	60 Page Draft of Main Project Document	9/27/2021	11/5/2021	Unassigned	Group 46
7	100 Page Report Submission (updated) of Main Project Document	11/8/2021	11/19/2021	Unassigned	Group 46
8	Final product of Main Project Document	11/22/2021	12/7/2021	Unassigned	Group 46
	Research, Documentation & Design				
9	Thermal Sensors	9/27/2021	10/11/2021	In development	Christian
10	Microphone Installation	9/27/2021	10/11/2021	In development	Jason
11	Machine Learning Algorithm	9/27/2021	10/11/2021	In development	David
12	Sleep Tracker	9/27/2021	10/11/2021	In development	Kevin
13	Auxiliary Controls	9/27/2021	10/11/2021	In development	Jason
14	App creation	10/18/2021	11/6/2021	In development	Group 46
15	Passive Cooling System	10/18/2021	11/6/2021	In development	David
16	Motion sensor	10/18/2021	11/6/2021	In development	Kevin
17	Pressure Sensor	10/18/2021	11/6/2021	In development	Christian
18	Power supply	10/18/2021	11/17/2021	In development	Jason
19	Purchasing & Testing of Supplies	11/17/2021	11/26/2021	In development	Group 46
	Senior Design II				
20	Prototype Development	11/30/2021	12/3/2021	In development	Group 46
21	Testing Phase	TBD	TBD		Group 46
22	Finalize Prototype	TBD	TBD		Group 46
23	Project Presentation (Peer)	TBD	TBD		Group 46
24	Report Deadline	TBD	TBD		Group 46
25	Final Presentation	TBD	TBD		Group 46

Section 6: References

Smart Pillow technology:

- <https://remfit.com/pages/rem-fit-technology>

Lecture 5 - The Requirement for Specification:

- <https://webcourses.ucf.edu/courses/1384424/pages/lecture-5-abet1-the-requirement-for-specification>

Google Shopping - Price estimate for electronics:

- [https://www.google.com/search?q=microcontroller+board&rlz=1C5CHFA_enUS872US872&biw=1440&bih=708&tbm=shop&sxsrf=AQae_mvJhBbLFSXVGfdAH2t9KOPeUdwN1Jw%3A1631822306587&ei=4qFDYd-II5nAOPEPidaa0A0&oq=microcontroller+board&gs_lcp=Cgtwcm9kdWN0cy1jYxADMgUIABCABDIFCAAQgAQyBQgAEIAEMgQIABAYMgQIABAYMgQIABAYMgQIABAYMgQIABAYMgQIABAYMgQIABAYMgQIABAYMgQIABAYOgQIIxAnOgQIABBDOgoIABCxAxCDARBDOgsIABCABBCxAxCDAToECAAAQAzoNCAAQgAQQsQMgwEQCjoHCAAQgAQQCIDCJFjsdWC8dmgCcAB4AIABsgGIAZkSkgeEEMTcuN5gBAKABAABAQ&sclient=products-cc&ved=0ahUKEwjfnq7no4TzAhUZIDQIHQmrBtoQ4dUDCA&uact=5](https://www.google.com/search?q=microcontroller+board&rlz=1C5CHFA_enUS872US872&biw=1440&bih=708&tbm=shop&sxsrf=AQae_mvJhBbLFSXVGfdAH2t9KOPeUdwN1Jw%3A1631822306587&ei=4qFDYd-II5nAOPEPidaa0A0&oq=microcontroller+board&gs_lcp=Cgtwcm9kdWN0cy1jYxADMgUIABCABDIFCAAQgAQyBQgAEIAEMgQIABAYMgQIABAYMgQIABAYMgQIABAYMgQIABAYMgQIABAYMgQIABAYMgQIABAYMgQIABAYMgQIABAYOgQIIxAnOgQIABBDOgoIABCxAxCDARBDOgsIABCABBCxAxCDAToECAAAQAzoNCAAQgAQQsQMgwEQCjoHCAAQgAQQCIDCJFjsdWC8dmgCcAB4AIABsgGIAZkSkgeEEMTcuN5gBAKABAABAQ&sclient=products-cc&ved=0ahUKEwjfnq7no4TzAhUZIDQIHQmrBtoQ4dUDCA&uact=5)

Sleep Facts:

- <https://www.ninds.nih.gov/Disorders/Patient-Caregiver-Education/Understanding-Sleep>

Sleep Foundation best pillows:

- <https://www.sleepfoundation.org/best-pillows>