EE-585 PROJECT PLANNING PAPER: “**Grandma’s House**”

Team Name: **GoGetter**

Team members:

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1 SUMMARY

Alzheimer’s disease or other dementia causes people to lose their ability to recognize familiar places and faces. It’s common for grandparents living with dementia to wander or become lost or confused about their location, and it can happen at any stage of the disease. Although common, wandering can be dangerous and the stress of this risk weighs heavily on caregivers and family. The project is designed to detect your grandma or loved one’s rising from bed by monitoring his/her body weight and motion. It also detects the location of grandma within the house. An alarm will go off when the system detects anything “abnormal” about the grandma's location.

2 OVERVIEW

In order to create a safe environment for both dementia patients and their families, the systems need to be installed around the house (bedroom and living room are the most important). All the sensors around the house can count how many people are currently in the house. The sensor system will be active at all times with the following process:

1. Using weight sensors such as strain gauge to determine when the patient leaves their bed/couch/sofa.

2. Using different motion sensors and infrared sensors to determine when the patient (leaves their room/ entering another room).

4. Transmission of all collected data to a microprocessor (Arduino) and interpret them.

5. Upload the information on IoT cloud/webpage

6. When the patient leaves their bedroom during an unwanted time and the movement system indicates that the patient has left the room/house, the system will set an alarm to notify their caregivers (family members or neighbors).

7. When the system does not detect anyone for a period of time (30 minutes to 1 hour), it will set an alarm to notify caregivers.

8. The system will be hidden out of sight and without any wearable accessories, therefore, eliminate the chance of the patient messing with the machine.

3 TEAM SKILLS ANALYSIS

We have a team of five that are all electrical engineering majors which is good for hardware completion, but at the same time, we're also facing some challenges for software completion. The project we're working on is called "Grandma House"; some sensors, circuit board, alarm, microprocessor, and LEDs are used to detect the whereabouts of our grandma in the house. All data collected will be transferred and analyzed through the microprocessor Arduino software. Even though the team is not specialized in software or programming; however, in the first semester, we're learning to use software such as Arduino or Multisim as the project goes on to modify and optimize our project outcome. Based on our skill matrix and interest the team is capable of working on complicated hardware such as designing circuit boards, reading circuit schematics, familiarizing with electronic devices and equipment such as Oscilloscopes, spectrum analyzers, RF devices, DMM, and soldering techniques to complete our hardware part. At the same time, the lack of software knowledge is putting some challenges on the team to complete the software part.

Optimistically, we're confident that the project can be done despite some software challenges. The team is dividing some certain tasks to each member which we feel is

suitable for their skill set. Some of our team members who have worked on or are experienced in the electronic field can work on the breadboard, sensors, components, motor, power supply, and wiring system for hardware needs. Some team members are researching and working on Arduino microprocessor software, wifi connection, webpage to analyze the data transmitted from the circuit LEDs and alarm system.

4 LEGAL & ETHICAL ANALYSIS

Some products on the market also aim to help reduce wandering issues in dementia patients. The most notable product is called SafeWander. The SafeWander system functions very similar to our project but with a wearable GPS tracker that needs to be on the patient at all times. But one of the key features that define our project is that the sensor system will operate without any wearable tracker, thus eliminating the risk of the patient removing the tracker. The system will also be hidden out of sight with strong housing to prevent any interruptions from humans or the surrounding environment.

The system has many potential security problems that the team needs to consider. If someone can get on the IoT server/ webpage, they will know exactly how many people are in that house at any given moment. They can learn the pattern and know when the house is most vulnerable.

The team needs to determine the chance of a false alarm. Because the system operates without any wearable tracker, the risk of a nonfunctional system will lead to the patient going missing which may result in injuries or even death. A safety measure needs to be added to notify the caregivers when the system did not detect the patient for a certain amount of time.

5 MILESTONES

The following table describes team GoGetters major project milestones. These milestones are expected to be reached by the end of the workweek (Sunday):

Topic	Due Date	Team Member
Project management (weekly assignments, progress tracking, ...etc.)	Every Sunday	All
Research weight sensors (Strain Gauges)	Sep. 18	Abdull, Phuong
Research motion sensors (PIR sensor, IR Break Beam Sensor)	Sep. 18	Abdull, Khanh
Research Arduino microprocessors (HX711 Library, IR Library)	Oct. 3	Marshall, Phuong
Research on wifi capabilities with Arduino	Oct. 15	Marshall, Phuong
Research on 3D modeling (case)	Oct. 15	Khanh
Research/design power supply (Multisim)	Oct. 15	Mutlaq, Abdull, Khanh
Logic flow diagram of code for the Arduino	Oct. 15	All
Development environment build (Use lab computers or remote machines to design our circuits and our software) and testing	Oct. 22	All
Parts ordering for Prototype	Oct. 29	All
Prototype Build	Nov. 5	All
First Article Testing	Nov. 12	All
Showcase Presentation	Nov. 19	All

6 METRICS

We will use an excel spreadsheet. The metrics will be given to each team member. We will track each task to be completed with a completion percentage and date completed.

Each task will be marked as complete after it has been accomplished and reviewed by another team member. To show the hardware has been completed it will need to be able to show that it is doing the task it was meant to do. To show that the software on the Arduino is completed, it will need to show that the detection system is working and can predict correctly 90-95% of the time.

7 ACQUISITION SCHEDULE :

To achieve the project goals, we must divide our work into small tasks and we will allocate a certain time for each task, every task is a milestone in the project and has to be done at the dedicated time to open the working process of the next task, the main controller will monitor all the inputs and outputs is the Arduino board, it will sense the human weight using four load cell that will be installed under the user bed, for example, installing a load cell on each leg of the bed, the load cells will measure the bed weight including the weight of the user, and will detect the user's existence depending on the weight.

Week	Acquisition Schedule: 1 st Semester	Cost
Week 6	● Studying the block diagram ● Search for desired components ● Compare prices and delivery dates	--
Week 7	● Ordering main controller:15$ ● Power supply 5v:12$ ● Wires: 10$	40$

	• USB cable 3$	
Week 8	• Purchase the weight sensor parts • 4 pcs 50kg Load Cells • HX711	12$
Week 9	• Ordering IR sensors (detecting incoming or outgoing persons), this sensor should cover 1.5 meters with break beam sensing	32$
Week 10	• Programming board (uploading code)	-
Week 11	Ordering the prototyping components • Box • Base • connectors	50$
Week 12	Finalize the prototype	--
Week 13	• Make desired modifications to both system and software	--
TOTAL	134$	

8 DATA CONFIGURATION MANAGEMENT PLAN

We have decided to store our data on Google Drive and Github. All the weekly documents will be shared with the whole team on Google Drive. We can add and edit any document simultaneously. For the software (software development, schematics, pictures, etc.), we can put it on Github and share it with each member. With these tools, we

can sync our workflow and work offline when we need to. Our final prototype will most likely be two boards (one sensor motherboard and one alarm daughterboard).

Currently, there are three members(Khanh, Phuong, Marshall) that have access to the Arduino microcontroller. The three will most likely be responsible for writing the sensor system's logic. The team will work together to design a schematic for the prototype.

9 SOFTWARE DEVELOPMENT MODEL

We will be using Multisim for testing the hardware. Arduino IDE will be used to program the Arduino Uno Wi-Fi Rev2. Using GitHub to find libraries that have the capabilities of programming the board to use the sensors we are using for our project.

10 FIRST SEMESTER SCHEDULE

The following table describes GoGetter's first-semester schedule:

Week	Deliverable
Week 6	● Design the system block diagram ● Check compatibility between components
Week 7	● Decide the main controller board ● Decide the IDE for developing the code
Week 8	● Ordering the components ● Research about the available IoT clouds supported by the main controller board
Week 9	● Assembling the weight sensor to the main controller ● Develop test code to read and display weight

Week 10	• Assembling IR sensors to the mainboard • Develop testing code for sensors
Week 11	• Connect WIFI modem to the mainboard • Program WIFI modem to connect to local Wi-Fi network • Develop code to send and receive data to a WIFI modem
Week 12	• Configure the selected IoT server to connect to our device • Program Wi-Fi modem with the desired IoT credentials • Send data from controller to cloud
Week 13	• Run overall test • Make desired modifications to both system and software
Week 14	• Finalize the final prototype • Make final real tests and modifications
Week 15	• Document the steps of work • Draw the final schematics and connections • Prepare and plan for the next steps.