

# **Technical Product Specification Paper**



**Class:** EE 585

**Team Name:** Go-Getter

**Instructor:** Caskel Stallard

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**Product description:** This device will consist of two parts. First, a sensor system that is located under the patient bed and throughout the house to collect and analyze data with an Arduino microcontroller. Each sensor will have an RF24 module and Arduino Nano to transfer data wirelessly. Second, an alarm that is designed to go off and send an SMS notification to the caregiver when the system indicates that grandma is doing something unusual.

**General requirements:**

- Indoor environment:
  - Temperature Range: 60-80 F
  - Humidity: 30-50%
- Internet service: wireless connection for LAN configuration.
- Telecommunication devices with service connection

**Alternate Considerations:**

Changes	Reason	Pros	Cons
Use IR sensor instead of PIR sensor	PIR has a wide detection range and will interfere with other PIR sensors when put in close proximity	_IR allow directional detection	
Use SMS as an alarm instead of emails	People tend to check their messages more than emails	_SMS is more effective as a notification tool	_After using more than 90MB, we have to pay to use the service _Estimate around \$5-10 per month
Use RF24 transceiver module	As the project scopes grow from a room to a house, wiring all the modules together is not practical.	_Allow wireless data transfer in	_Extra cost _Each module need its own power supply

**Regulations:**

- Battery:
  - Follow the American National Standard for Portable Lithium Primary Cells and Batteries Safety Standard (ANSI C18.1M Part 1-2001).
- Wireless:
  - The wifi has to comply with IEEE 802.11 n/g/b standard.

- The RF transceiver module must comply with FCC Equipment Authorization for RF Device (Products operating at 9 kHz to 3000 GHz have the potential to cause interference with radio services).
- Sensor: (Strain gauge, IR motion sensor)
  - All boards must comply with RoHS Directive (lead-free solder finish and meet the restricted concentration levels for dangerous chemicals such as mercury, cadmium, hexavalent chromium, etc.)

### **Market pricing:**

The market pricing of the whole device will be roughly \$170. It is based on the area of the house we want to cover. At this price, the device will cover 3 bedrooms, a lounge, a kitchen, and 2 bathrooms. So, if the requirement of the space is more then, the price of the device will rise to \$230-250 considering the need for more motion sensors and alarms.

### **Cost to make:**

The motion sensors will cost about \$5. More than 20 motion sensors will be required. When it comes to the Arduino microcontroller, the cost varies and if they will be bought in more quantity then their price will be less as compared to buying them individually. The price of a single unit is \$15-20. Alarms and LEDs on the other hand will cost roughly \$100 to buy and then integrate with the system.

### **Competitor:**

When it comes to the competition of this device, there are some devices of similar nature available in the market such as True Sense and Rest Assured, but these are not standalone devices. These are complete systems that need to be integrated within your house and they are based on monthly subscriptions. The cost models are not as effective as the proposed product "Grandma House". This device is based on the BOUF model (Buy Once Utilize Forever). Investment in this device is a one-time thing and it will last you almost forever considering the lifetime of the Arduino microcontroller and the motion sensors.

### **Market Size:**

The market size of this product is not as vast as the baby monitoring devices because about 50 million people around the world have Alzheimer's disease or another type of dementia. The data set from the World Health Organization (WHO) revealed that about 60% of people living with dementia and/or Alzheimer's are from a low or middle-income country throughout the globe. That is why the market size of devices of Grandma House nature is not as popular as the remote baby monitoring devices.

### **Sell Price/ Value:**

When it comes to the selling price or market value of this device. It can be considered mediocre to high. Since there are no similar devices available in the market, it is safe to say that Grandma House: Alzheimer's Monitoring Device is one of a kind that needs to be valued at a normal rate in the beginning so that people from all socioeconomic backgrounds can afford it. The data from WHO revealed that the global 60% population with Alzheimer's disease is from middle-income earning countries. With the passage of time, the market value and the selling price will be increased as per the normal business models.

### **Percent Profit**

For now, there is very little profit from selling this device because we want the market and the target audience to be familiarized with it. Once the device is completely introduced to the intended audience, the profits can be estimated at 5% per device that means the profit will be \$10 per unit.

**Software details :**

1. Each Arduino will be equipped with an RF24 that will send a signal back to the main Arduino wirelessly, then the main Arduino will interpret the information and will send an SMS message to the caretaker's phone.
2. A recording device will have the following sensors attached:
  - a. IR Sensor / Weight Sensor
  - b. Fingerprint Scanner (Deactivate the system if a caretaker is going into that location. And reactivate the system when caretaker leaves)
3. Depending on the location of the sensors it will notify the caretaker of the whereabouts of the patient by sending an SMS message to their mobile devices

**Design Specifications (Hardware):**

- The product will come with 3 different modules minimum, all batteries powered. All modules will have an enclosed, rectangular case.
- The RF24 transceiver network (communication method between Arduino units/modules) must be able to operate with 20+ nodes within a 1500-2500 sq ft residence.
- Case enclosure must meet IP64 of International Protection ratings, meaning it offers total protection against dust and protection against water splashes from all directions.

Design Specifications		
Arduino Processor Board		
	Dimensions	13.7 x 8.4 x 1.85 in.

	Weight	2.15 lbs.
	Operating Voltage	3.3 V to 12 V
	Compatible	PC and Mac
	Software	Arduino IDE
<b>Battery Cell</b>		
	Voltage	12 V
<b>LED</b>		
	Color	Red, Yellow, Blue, Green
<b>RF24 Receiver Module</b>		
	Operating Voltage	3.3 V
	Range	50 to 200 feet
	Frequency Range	9 kHz to 2.4 GHz
<b>Weight sensors</b>		
	Load Weight (4 pieces)	50 Kg. X 4
<b>HX711 AD Module</b>		
	Operating Voltage	2.6 V – 5.5 V

	Item Weight	2.8 ounces
	Dimension	5.71 x 4.17 x 0.67 in.
<b>Infrared Proximity Sensor</b>		
	Dimensions	29.5 x 13 x 21.6 mm
	Range	20 to 150 cm
	Operating Voltage	4.5 V to 5.5 V
<b>WIFI</b>		
	Comply With	IEEE 802.11 n/g/b standard
<b>Communication</b>		
	Type	SMS