PAIGE Wearable Dementia Protector

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Context

- Dementia is a symptom or a group of related symptoms that are closely correlated with ever-decreasing brain function, especially affecting people over the age of 65.
- It currently affects over 50 million people worldwide, and this number is expected to double every 20 years [1].
- There currently exists no cure or treatment to slow the progression of dementia, therefore it is essential to develop ways to aid with the management of daily tasks.
- Whether it is age-related memory loss or severe cases of Alzheimer's disease, dementia is something that affects the everyday lives of a very large group of people, and we have made it our goal to help them handle their condition a little bit better.

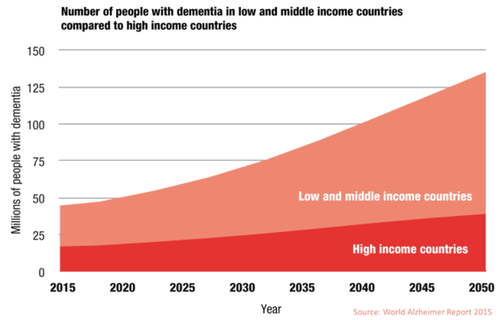


Figure 1. A graph showing the progression of dementia [1]

Requirements

"A device that would help keep a patient safe should they suffer an episode out alone. It records data to provide valuable insight for their GP (also potentially research material for the various societies working on cures/preventative methods and strategies) This also allows the primary carer of the sufferer, certainly in the early stages, the peace of mind that they can be allowed to venture out on their own still. Thus giving them the chance to live a normal life for as long as possible, and allowing the carer some respite." - IBM

- ➢ Wearable device
- ➢ Artificially intelligent (speech to text, conversation and text to speech in order to convey a personality to the wearer)
- ➢ Device needs to detect when user is having an 'episode' through sensors and user inputs.
- ➢ Call for help through SMS
- ➢ Provide real-time location tracking
- ➢ Log medical data for health monitoring

[1] https://www.alz.co.uk/research/statistics

Final Design

Display
Adafruit PiTFT

Processing Unit
Raspberry Pi 3 B+

Sensor board
Pulse, Temperature and Humidity

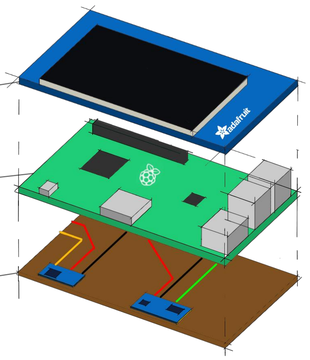


Figure 2. Schematic diagram of the final design

Display
Displays the User Interface (UI) to provide visual support for the user. UI contains:

- Interactive Help Button
- Date and Time
- Phone connection status
- Assistant speech
- Current Pulse measurements in BPM
- Microphone status

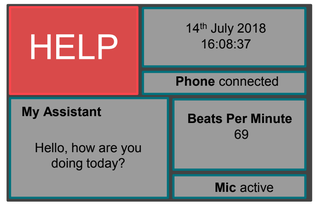


Figure 3. Sketch of the User Interface

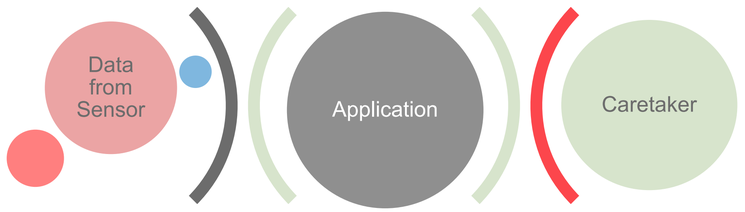
Processing Unit

- Logs sensor data to the cloud
- Connects sensor inputs to UI
- Outputs to speaker and Android Application
- Runs MQTT broker

Sensor Board

- Contains all 3 sensors
- Analogue to Digital conversion

Intelligent Assistant

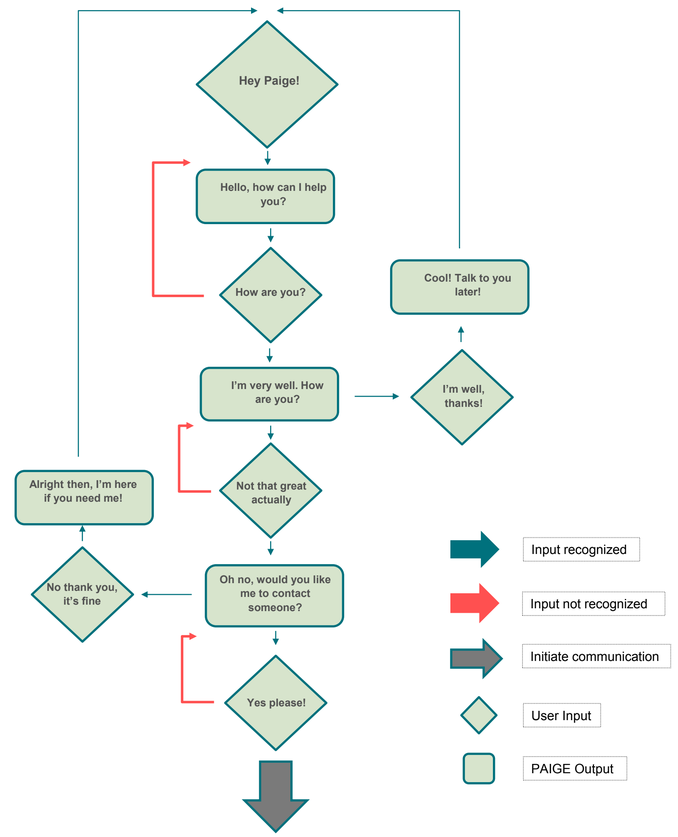


If data is outside the normative range or user expresses concern, an automatic message is sent to the caretaker. Device navigates user to a 'safe place' and upholds conversation.

Generated warning message published to MQTT broker, retrieved by the App on client's phone and sent to the caretaker.

Message is received by the caretaker with a link to the precise location of the patient.

Conversation



Conclusion & Future Work

The created device satisfies the given requirements, but there is room for improvement given that it is only a prototype. In future, the wearable would have to be made significantly smaller to be more comfortable. Commercially available hardware and software would have to be substituted for application-specific alternatives in order to improve the quality of the AI as well as the overall performance of the device.

Imperial College London

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