Smart Mini Assisted Living Environment (SMALE)

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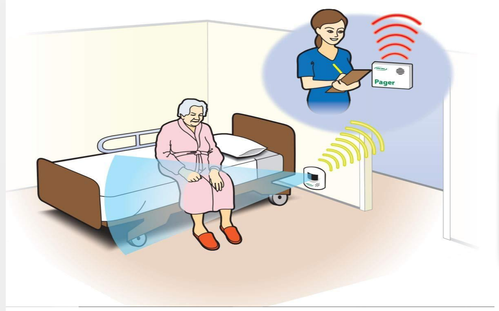
Introduction

- There is a growth of the senior population (65+) in the United States. About 2.5 million senior people are treated in the Emergency Room due to fall injuries.
- Current fall detection devices used by senior facilities such as wrist/pendant buttons have many limitations:
  - Residents don't like to wear them
  - They take them off and forget to put back on
  - Don't have voice features to notify caregivers when they fall far away from their pendant

Objectives

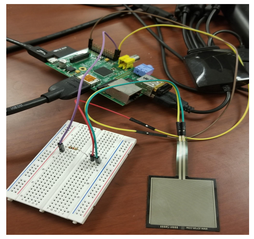
Proposed solution: an integration of a **motion sensor,** an **acoustic sensor** and a **smart carpet** to detect falls and capture the resident daily activities (ADL).

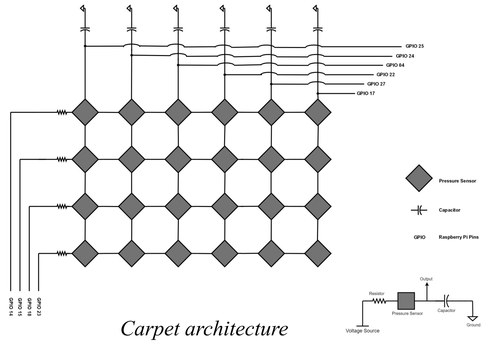
- a motion sensor to improve the fall detection algorithm while reducing the processing and energy overhead
- an acoustic sensor to notify caregivers by detecting sound level or by saying specific keywords such as "help"
- a smart carpet to detect falls and keep track of steps to determine resident's ADLs and walking speed



Methodology

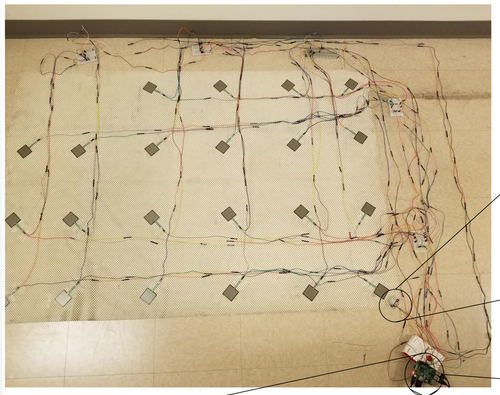
- 24 Pressure sensors
- Motion sensor
- Acoustic sensor
- Raspberry Pi



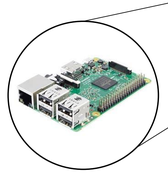


Carpet architecture

Prototype: ***integration of carpet with acoustic and motion sensors***



Motion Sensor



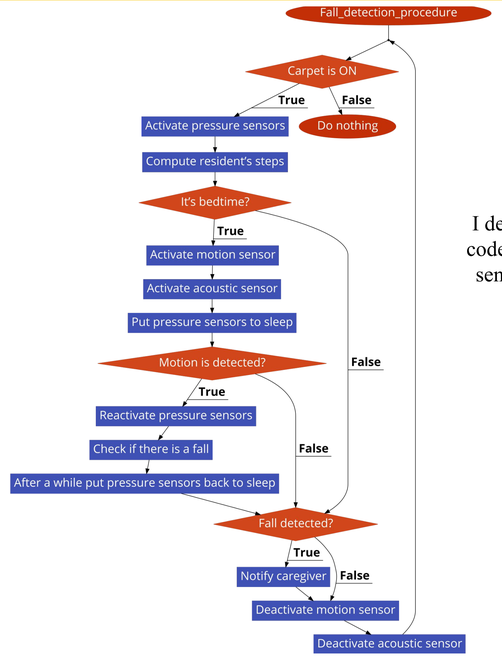
Raspberry Pi

Acoustic Sensor

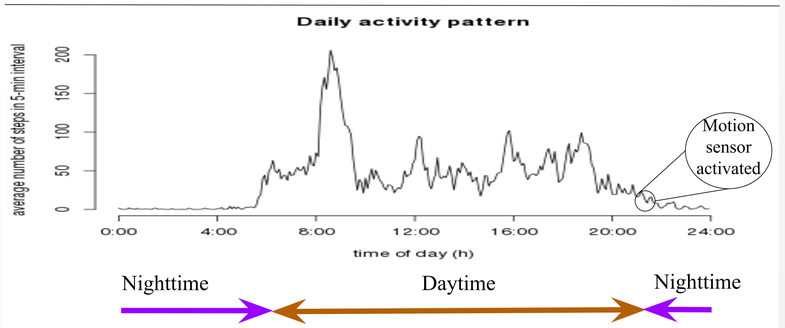
References

- The Population 65 Years and Older in the United States: 2016. (n.d.). Retrieved from https://www.census.gov/content/dam/Census/library/publications/2018/acs/ACS-38.pdf
- N. S. Alhassoun, M. Y. S. Uddin and N. Venkatasubramanian, "SAFER: An IoT-based perpetual safe community awareness and alerting network," 2017 Eighth International Green and Sustainable Computing Conference (IGSC), Orlando, FL, 2017, pp. 1-8.

Algorithm and Results



I designed and implemented a code that integrates and fuses 3 sensors to detect seniors falls accurately.



NB: Bedtime can be adjusted based on resident's profile.

Conclusion

Future work

- Improve processing and energy overhead to reduce power consumption
- Enhance the fall detection algorithm by adding more sensors

Acknowledgement

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