

# Remote Monitoring: How to track and monitor your loved ones in a civilized and purposeful manner

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## Introduction

Monitoring older adults at home can help patients recover from illness at home safely and check health and wellness of patients.

This study tested a monitoring system including wearable technology and an indoor positioning system

## Background

- By 2030, 23% of Canada's population will be 65+ [1]
- Overcrowded hospitals and situations like the COVID-19 pandemic where it was dangerous for seniors to go to the hospital make monitoring health at home ideal.
- The PATH Lab studies remote monitoring to ensure patients are safe and make Aging-in-place possible

## Technology Explained

- Two devices were tested, a Pozyx indoor positioning system, and a Fitbit Versa 3 smartwatch
- **Pozyx (Fig 1):** A wearable tag system that uses Ultra-wide band (UWB) radio technology to track location in a home.
- Four anchors are mounted to walls and send signals to a wearable tag to triangulate its position. Anchors are mounted high on the wall and 20 cm away from metal.
- **Fitbit Versa 3 (Fig 2):** A smartwatch that tracks your heart rate, calories burned, and steps.
- To collect the data from the Fitbit in real time, an online program was created by a member of the Path Lab

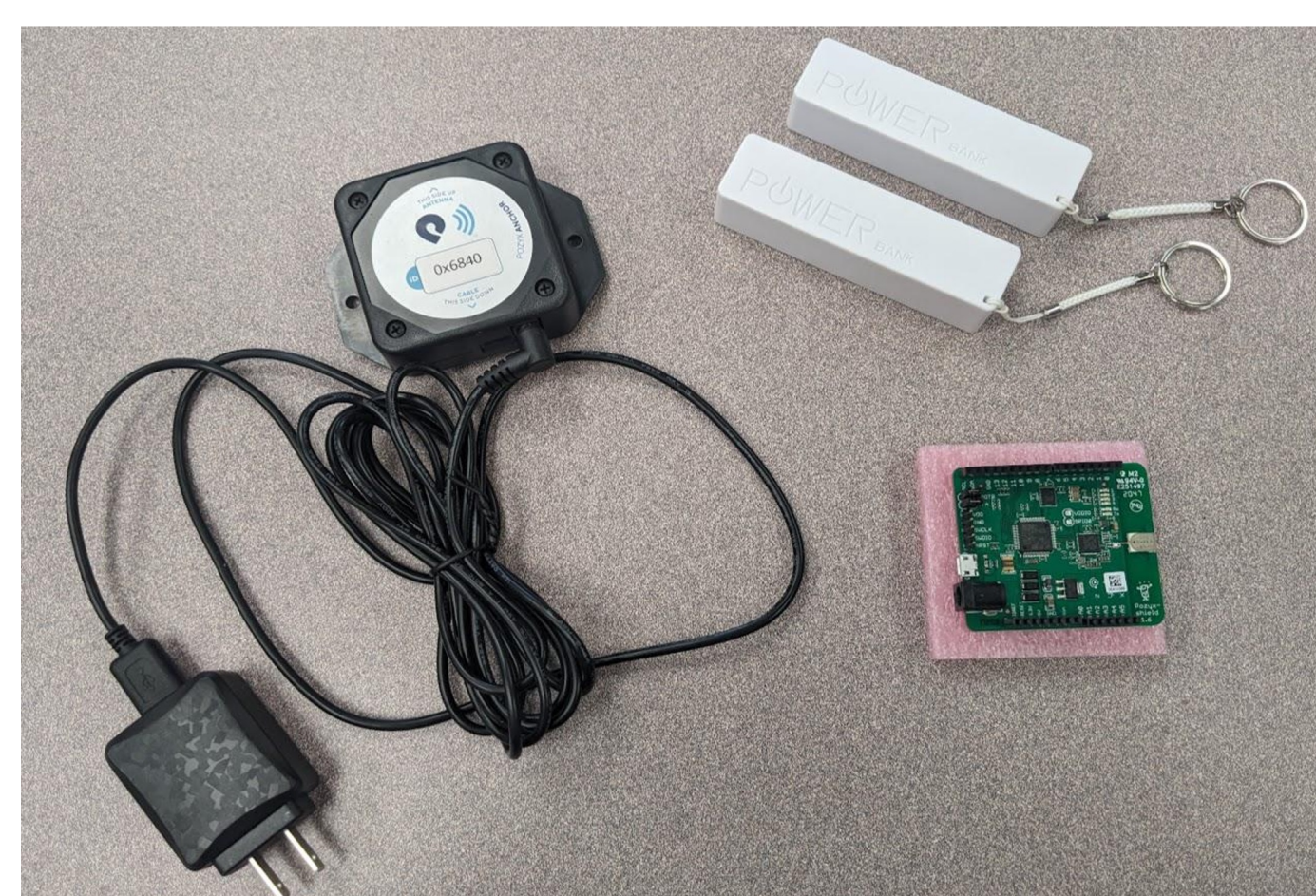


Figure 1: Left - master anchor, Top right - Power banks, Bottom right - green tag



Figure 2: Fitbit Versa 3

## Methods

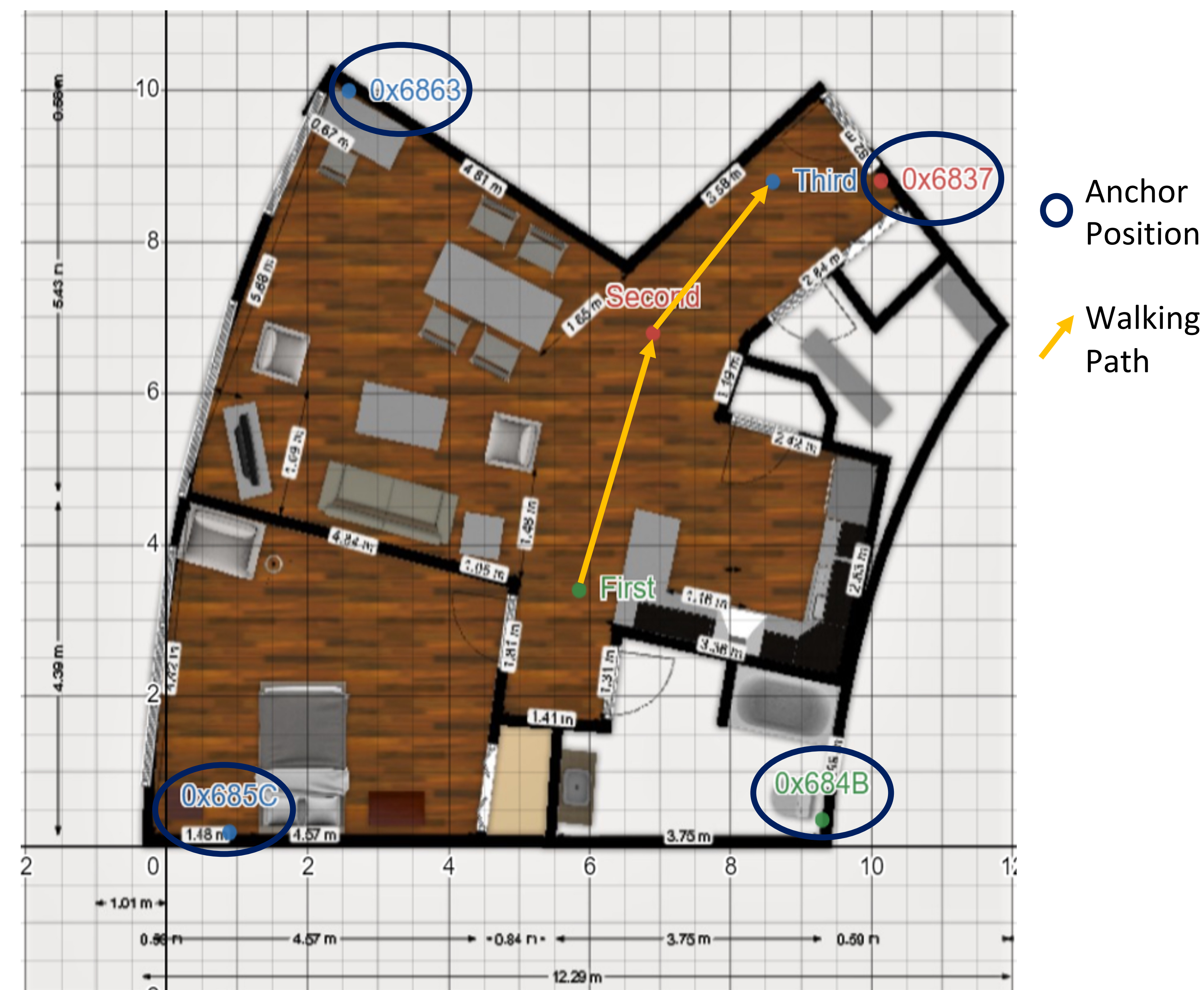


Figure 3: Layout of the Independent Living Suite

- Pozyx anchors mounted in a test condo at the Glenrose Rehab Hospital (Fig 3-7)
- Different walking protocols were devised and a path was marked in the condo (Figure 3)
- Three trials of walking along the path while wearing the Fitbit and Pozyx were completed
- Real-time data was extracted using Python and converted to CSV files for analysis
- Graphed all the device outputs using Excel

## Condo Suite



Figure 4: Bedroom – red dot indicates a Pozyx adapter on wall (Fig 3: 0x685C)

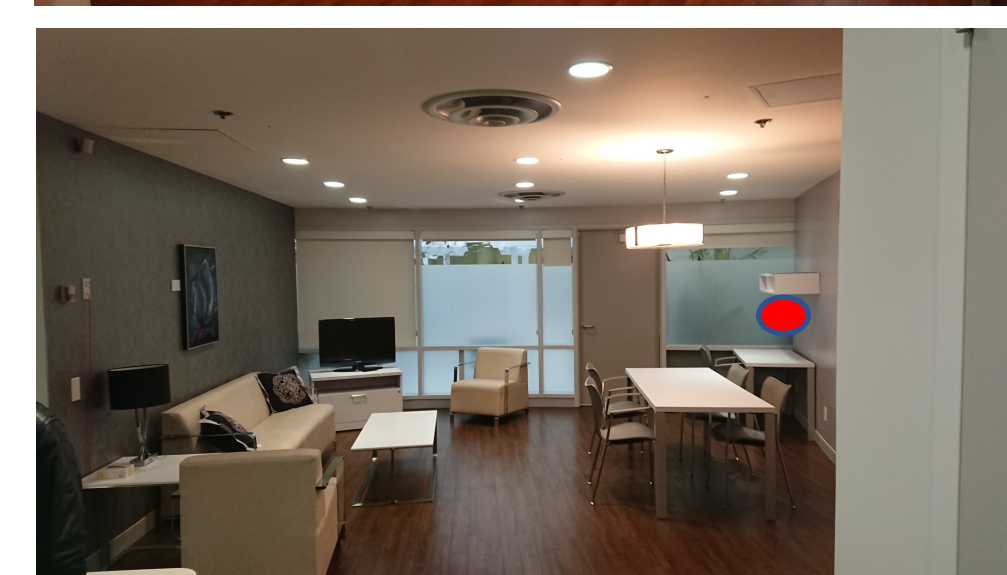


Figure 5: Living room (Fig 3: 0x6863)

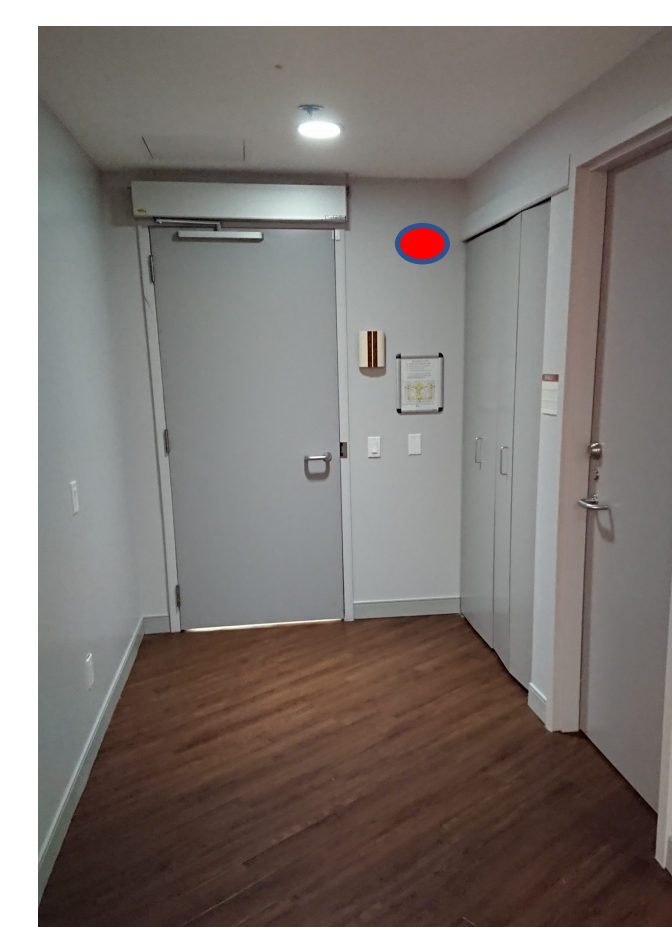


Figure 6: Main exit (Fig 3: 0x6837)



Figure 7: Bathroom (Fig 3: 0x684B)

## Results

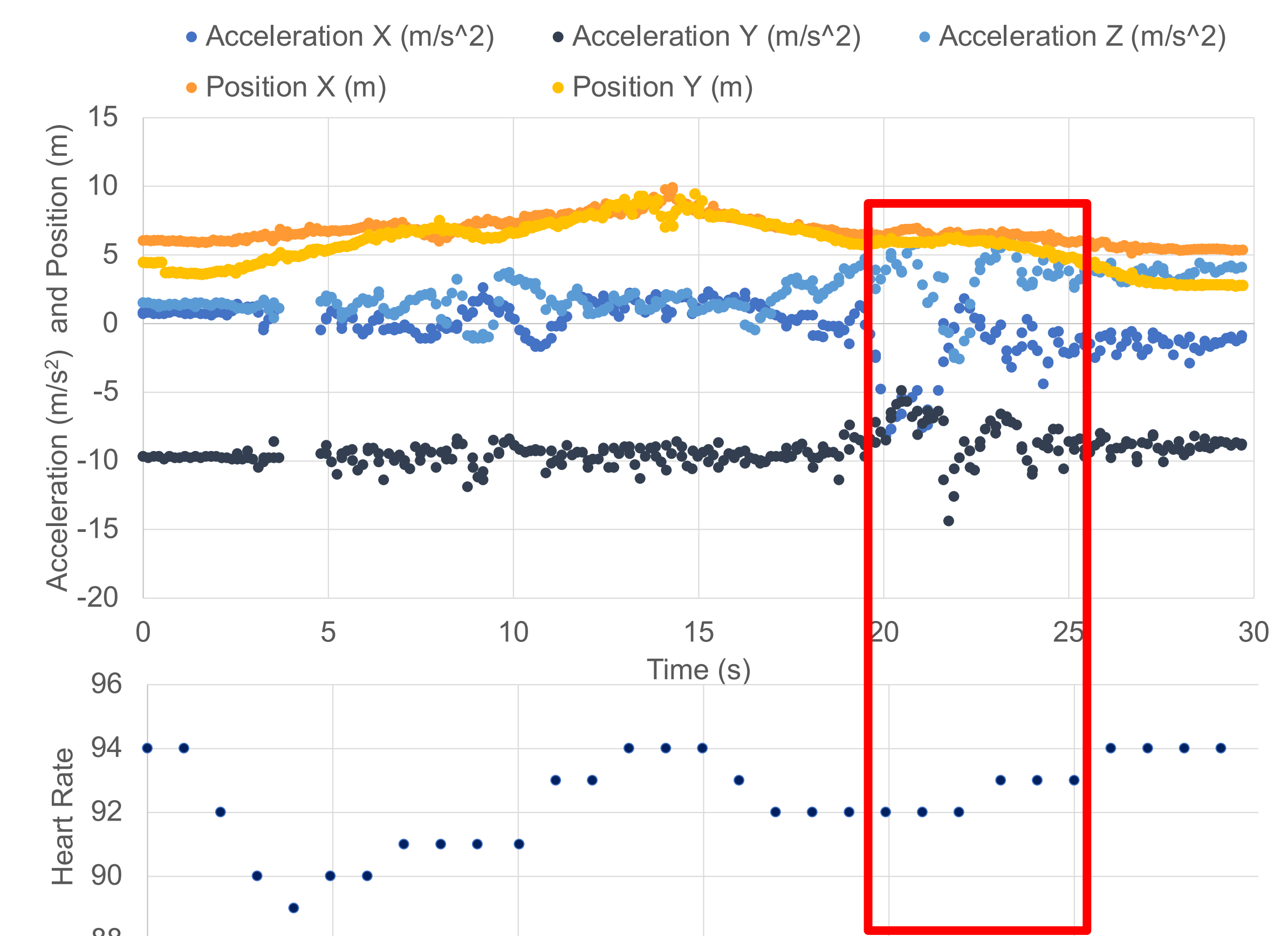


Figure 8:

- Figure 8 displays heart rate and acceleration data from Fitbit, and the position data from the Pozyx.
- Boxed area shows a drop in accelerometer movement and position remaining constant indicating imbalance.

## Discussion

### Study Limitations

- Test subject held the tag in the hand. Mounting to the body is more consistent.
- Fitbit was worn on left arm. Right arm or both may be useful if right handed

### Clinical Applications

- Theory behind localization is strong, but reliability and acceptability for patients needs to be tested

### Future Directions

- Technical evaluation to continue for coming months, then will recruit patients to test.
- Real-world implementation is multiple years away

## Acknowledgments and References

### Literature Cited:

1. E. and S. D. Canada, "Government of Canada," *Canada.ca*, 16-Feb-2021. [Online]. Available: <https://www.canada.ca/en/employment-social-development/programs/seniors-action-report.html>. [Accessed: 08-Aug-2022].

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