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Safe Sidewalk Navigation

Introduction

- Strolling down a sidewalk is not something often associated with danger, however, for the visually impaired, navigating obstacles can be complicated and even dangerous.

- This is especially prevalent with environmental damage, construction, and harsh weather such as heavy snow or ice.

- OAI Technologies recognizes this and looks to design a new technology to combat obstacles and provide low vision and blind people a new opportunity with navigation.

- The scope of our project aims to create a first prototype which detects obstacles around the user to map an environment. The obstacle size and distance from the user will be saved to a data storage unit to be analyzed via computer.

- This prototype will serve to provide OAI Technologies with a functioning device which may be advanced for their specific needs. The prototype will also be used to source data that will aid in machine learning programs to identify obstacles with a high degree of precision.

Design Process

- The solution has two main components: hardware and software. The hardware side of the solution consists of the sensors, image processor unit and audio output device. The software side of the solution is solely focused on image analysis to identify and map the environment around using artificial intelligence.

- Hardware devices(LIDAR, camera, ultrasonic sensor) continuously reads and captures data which is saved directly to the USB Flash Drive.

- The data from each of the hardware devices are compared and cross-checked for verification and redundancy.

- For the software aspect: The images captured from camera are time-stamped and saved separately for image analysis. Artificial intelligence techniques to be used for analysis.

- Map the environment around from the data collected by LIDAR in RVIZ.

- The system will output audible beeps and instructions in response to the objects recognized.

Details of Design

- The two images display the Hardware and Software sides of the design process, which displays how each hardware component interacts through the system architecture.
- Note: Both the Final Concept Design and System architecture are not finalized and may receive future revision.
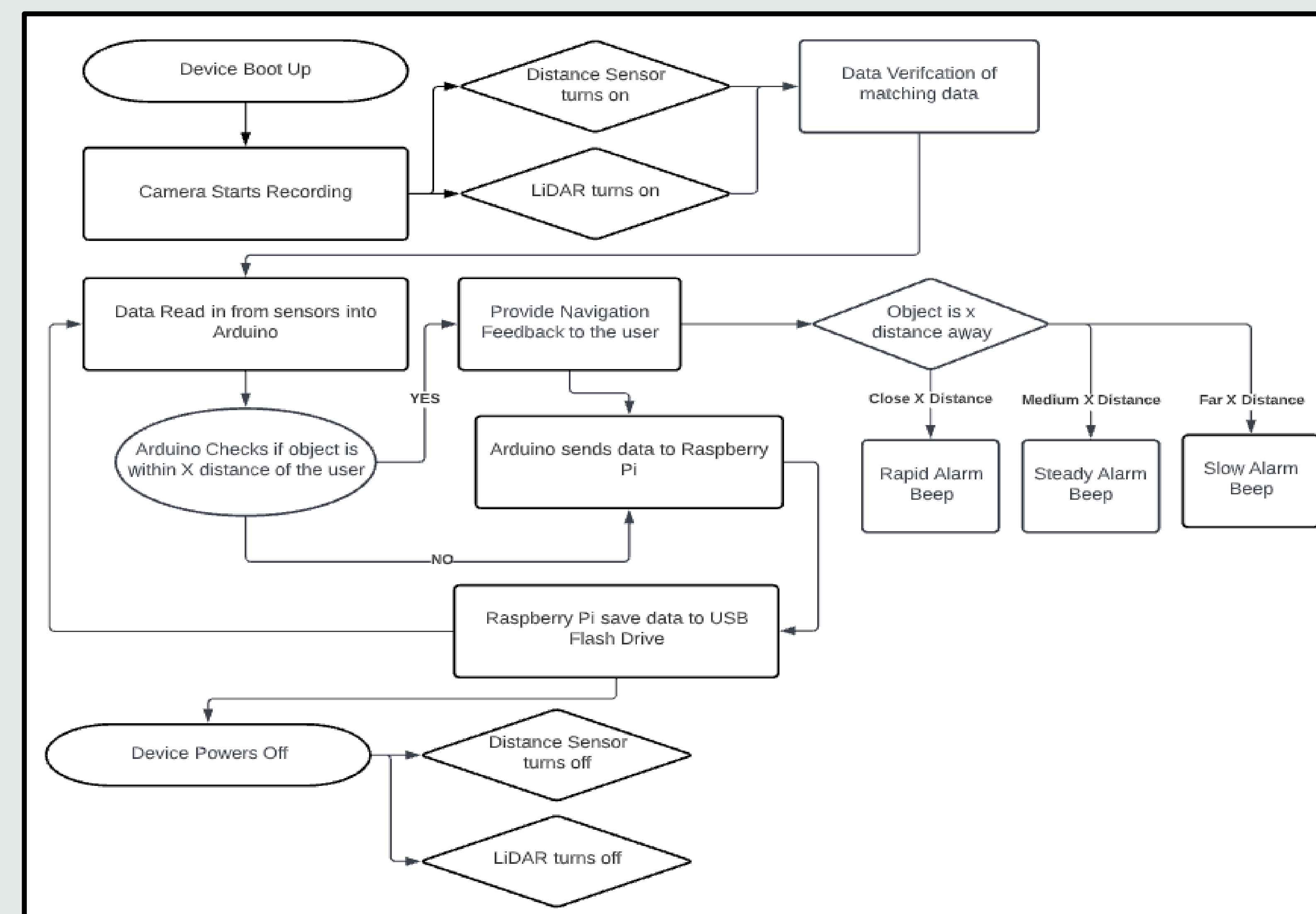
Verification

- Sensors will be tested for an accurate data reading.
- The battery life of the product will be sufficient for the device use.
- Camera will have a clear view of the user's path.
- Saved sensors distancing data time will match the camera time stamps to verify the product works as intended.

Conclusion

- To ensure that the product is reliable in detecting obstacles. Multiple different types of sensors will be used to ensure the device is still reliable if a sensor fails.
- The product will be contained in a water-resistant housing to make certain the device works in different weather conditions.
- Product will have the ability to save obstacle data.
- Product will provide the user with an option to view and annotate the saved data.

References

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- Frankel, D. M. (2019, May 28). Systems and methods for blind and visually impaired person environment navigation assistance. Google Patents. https://patents.google.com/patent/US10299982B2/en?q=buzzclip&oq=buzzclip