Playground Sensor

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Kingswood Ratepayers Association Resources

Abstract

Playgrounds are important in our community as they provide children with many learning opportunities through different types of outdoor play. Playgrounds are a safe environment that stimulates the physical, cognitive, and social development of children, while contributing to their mental and physical health. Constructing a playground for children can cost anywhere from $40,000 to hundreds of thousands of dollars, which is a huge investment from the city. Our goal with this project is to develop a technology to monitor playground usage to provide the city with data that can help the plan playground construction and maintenance schedule and spend their maintenance resources wisely.

Objectives & Deliverables

The following section provides a description of the specifics and measurable outcomes desired from the project. These include:

- The device should count the number of children using the equipment in the park, particularly those using the jungle gym as it is the most expensive piece of equipment within the playground
- The device must be capable of attaching to pre-existing equipment easily, with no major installation work required
- The device should record data with high accuracy and store the data in a removable storage device, as there won't be any wireless communication systems in place to send data
- The device must be built according to the highest safety standards to avoid harm of any users of the playground
- The device must not pose any privacy concerns to the users of the playground equipment
- The per-unit cost of the product should not exceed $500
- The device must be able to store data and the data should be easily retrievable
- The device must operate via its own power source; e.g battery packs or solar panels

Methodology

The project was enacted by breaking down each component of the device and analyzing the design characteristics needed for the component to satisfy the specifications of the project

Once all components are selected the system design can begin. This includes the hardware and software of the device as well as the device housing and mounting design.

Project Budget Summary

The expected expenses of the project are as follows:

- Sensor   - $50
- Processor   - $60
- Storage   - $20
- Battery   - $20
- Board and wiring   - $20
- Housing/mounting   - $50

Processor

Materials

The material required for the project are as follows:

- **Raspberry Pi 4 -** (Huge processing power in a compact board and supports I2C communication)

- **Time of Flight Sensors (VL53L1X) -** (Low cost sensor with (~25$) range of 40mm to 4m with millimeter resolution and is I2C compatible

- **2 x 20000mAh Disposable Batteries**
- **USB Drive**

I2C Communication

- Two wire interface
- Can accommodate upto 128 devices
- Allows multiple masters and slaves on the same bus
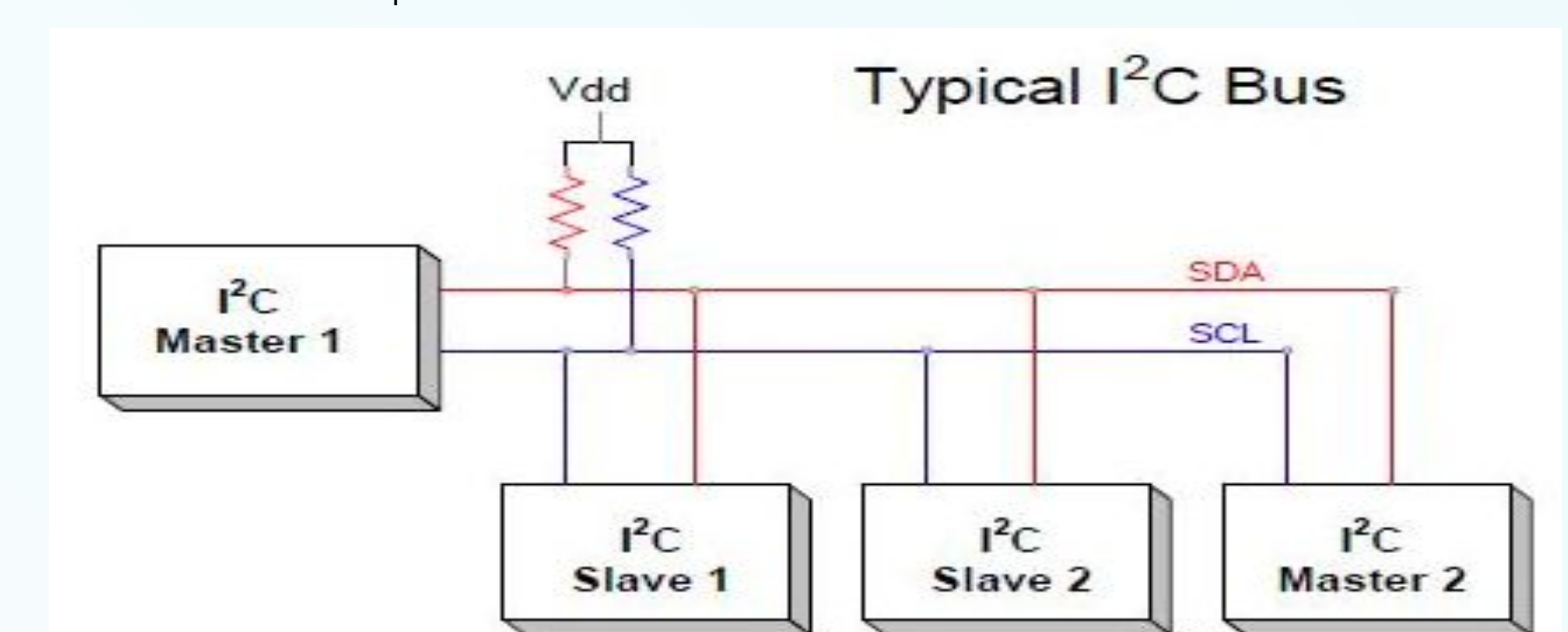
Sensor

Conclusion

By the end of the project, we will have created a fully functional prototype capable of recording the relative of playground equipment by children and store this information in an easy to read removable format. The prototype can then be used to gather real-world data that can be analyzed to accurately determine the total usage of parks. This project can potentially save cities thousands of dollars by allowing them to better allocate resources where most needed.

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