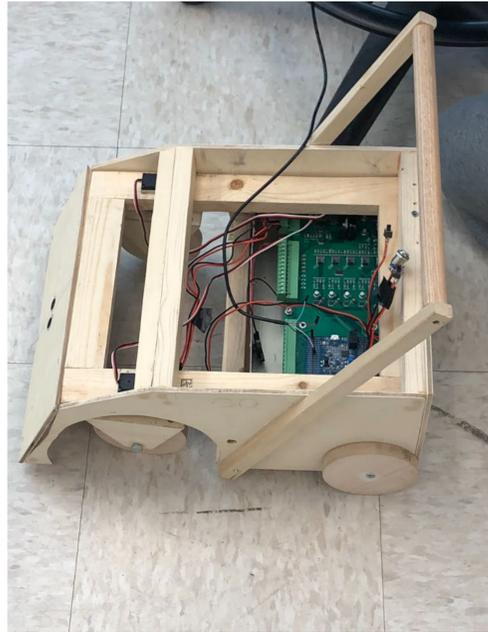


Walkmatic

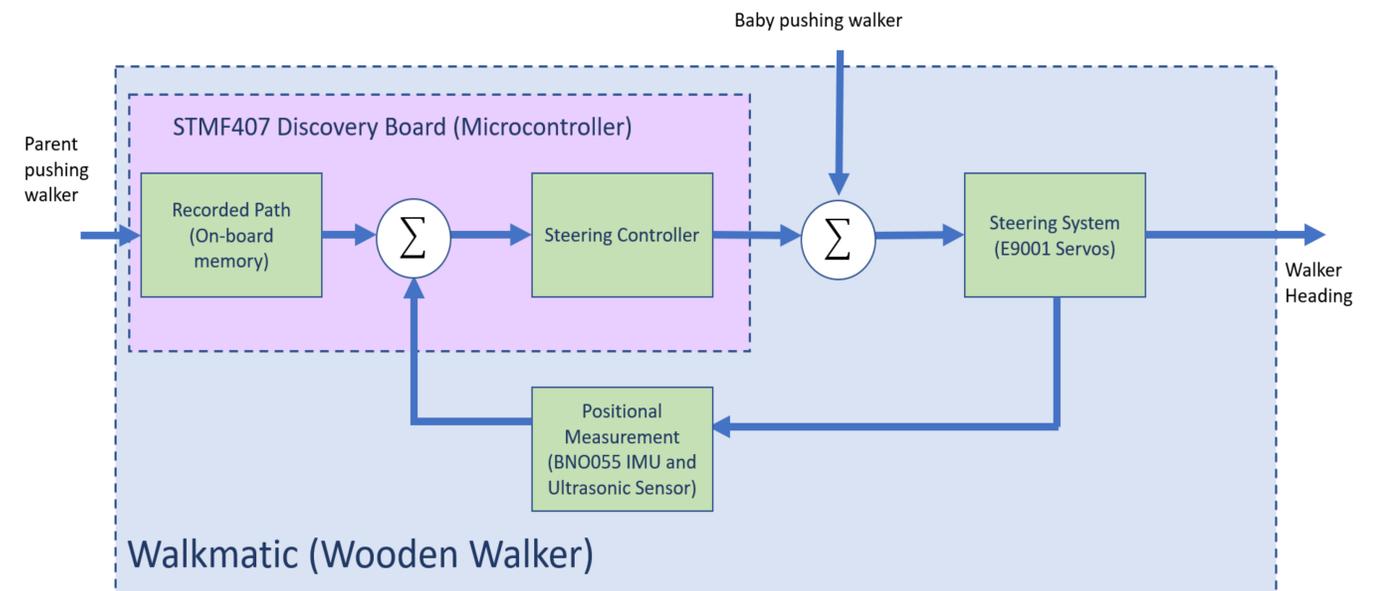
Project



The Walkmatic is a baby push toy with automated steering to keep babies from pushing the toy into walls or down the stairs. Parents who are anxious to watch their child learn how to walk will often buy push toys to help their child stand up while they learn to walk. Unfortunately, parents must constantly guide the push toy to prevent the baby from pushing it into obstacles. This can take a toll on parents' backs and knees. With the Walkmatic, parents can relax while they watch their baby play with their fun new toy.

When the Walkmatic is first turned on, the parent pushes the walker around a closed loop. The Walkmatic uses an IMU and an ultrasonic sensor to calculate its position along the path and saves this information in the on-board memory. As the baby pushes the Walkmatic, the toy automatically steers itself along the path the parent traced earlier. The Walkmatic provides a fun and safe option for helping babies learn to walk.

System



Methods

The Walkmatic project presented three main challenges: designing a safe electrical system to power the walker steering, obtaining an accurate position measurement, and designing a steering controller for a vehicle without control of the velocity.

1. The electrical system is managed by a custom designed and built PCB and powered by a 4 cell Li-Ion battery. The Walkmatic has active battery cell balancing to prevent overcharge.
2. The location is obtained through data from an IMU and an ultrasonic sensor. Data from these sensors is conditioned with a Binary Bayes Filter and frequency filters. The conditioned signals are fused to obtain relative position measurements with a complementary filter.
3. The steering controller calculates the error between the current curvature and heading of the walker and the path curvature and heading and sends control signals to the motors to correct the error.

Conclusion

The developed system can address each of the design challenges described in the methods section:

1. The Walkmatic safely powers the electronics and can use active battery cell balancing to prevent overcharge.
2. The Walkmatic can obtain accurate position measurements and use them to trace a path to follow.
3. The Walkmatic can follow a path with automatic steering to avoid walls and other obstacles.

