

Utilization of Open Sourced Technology and Software to Improve the Safety of Outdoor and Indoor Navigation: Applying Methods to Assist the Visually Impaired

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Computer technology has made large impacts on society however, there are still areas in which new technologies can be implemented in order to improve lives such as in the lives of the visually impaired. As of 2011 there are a reported 285 million visually impaired and 39 million blind individuals in the world. It is expected that in 2020 there will be 200 million visually impaired individuals and 36 million more blind individuals. Furthermore, 1 in 10 blind individuals use a wheelchair. These statistics and curiosity inspired me to pursue a project in which I engineered and programmed a self controlled wheelchair system for the visually impaired. The project uses a beagleboard and arduino for processing the code and to control the components incorporated within the system. A circuit was then created supporting arduino and wheelchair communication to allow input from both the joystick and arduino. An array of PING sensors and cameras were utilized in order to detect obstacles such as pedestrians, sidewalks, crosswalks, traffic signals, staircases, and vehicles in front of the system through algorithms created via the Arduino IDE and OpenCV. Restrooms were also detected indoors. GPS was used to give outdoor directions to user + detect vehicles. Indoor navigation was then carried out using wifi fingerprints and a novel algorithm to generate a map as wheelchair system moved within a building even if wifi was not present (these maps were applied using OpenStreetMap) and all of this information was relayed via a haptic feedback system. Creating a mobile app and generating algorithms to reduce the indoor mapping dependency on wifi are being looked into however, as the system stands now it is nearly 50% cheaper than other models currently available and ready for real world use.