

SUMMARY

The external radar was developed, tested and found to be viable solution for helping the robots cross certain roads. The external radar works by gathering data from radar sensor and transmitting it to a nearby robot via Wi-Fi. Robot can then use this additional information to autonomously assess traffic and safety with sufficient accuracy.

Many of the design choices were done to keep development time low. Most of the hardware used were widely available products, such as Raspberry Pi 3B+ and ATmega328p based Sleepy Pi 2 (which could be programmed using libraries developed for Arduino microcontrollers boards). The radar sensor already in use within the company was chosen as the sensor for the radar box. This enabled to get the sensor functional quickly and with relative ease.

Some preliminary testing of the device was also done. Not enough to mention in the main body, but it is worth to bring out that the device detected traffic and managed to transfer this data to robot with low latency. A difficult crossing for the robot was chosen as a test site, where robot could not see anything due to parked cars occluding the robot's sensors. With the help of external radar, robot was able to detect cars that it could not see otherwise well enough that the crossing could have been crossed autonomously.

Overall, 4 prototypes were produced, 2 deployed to USA, 1 is being tested in Estonia and 1 is discarded. The project is not active anymore due to company's shift of focus.

There are some problems yet to solve. For power management, a more sophisticated algorithm should be implemented if the device was to be actively used, so personnel could swap the battery as rarely as possible. Furthermore, there are currently no methods to detect whether the device has tilted/rotated. If the radar would suddenly be pointing at the ground or at the sky, it would show as if there was no traffic. This dangerous situation could be remedied by using an inertial motion unit, which can detect if the device has shifted.

Overall, author of this work thinks that the device is usable as is, but some additional development would be required to increase reliability and ease of use for operations.