Division of Industrial Electrical Engineering and Automation

Microwave Radar - The Future of Home Alarm Systems

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14 700 home intrusions were reported in Sweden in 2019. As the methods of the burglars improve, home alarm systems must keep up. The latest technology is not new, in fact it has been around since WWII. Say hello to the newest member of the motion sensor family: the radar.

Microwave radars have the ability to collect information about a target's speed, direction of movement and distance. This short range, high frequency radar is on the rise in multiple industries, as they are small, accurate and relatively cheap. The automotive industry, in particular, has pushed the development forward. Microwave radars are well suited for outdoor applications as they are insensitive to tough weather condition. Other home alarm system sensors, such as cameras and passive infrared sensors, may have issues with hot weather, heavy rain and fog.

In our master thesis, a home alarm prototype with an integrated radar was constructed. The prototype consists of an existing product that uses a passive infrared (PIR) sensor and a camera. The passive infrared sensor is used to detect an intruder and to activate the camera which is used to verify that it is not a false alarm. The purpose of adding the radar is to compensate for flaws that the PIR and camera have. The goal is to decrease the number of false alarms.

To verify that the radar works in the way that it should, several tests were conducted. These tests included walking, crawling and belly crawling past the sensor at different distances and at varying speed. Further, the radar was tested in an outside environment to see difference between moving plants and people. From the tests it was shown that the radar outperforms the PIR in detection capability and has a great potential.

Figure 1. The prototype.

A concern is the, in comparison, high power consumption of the radar. Compared to the PIR, the microwave radar needs a lot more current to operate and this need creates some challenges. Batteries often provide the power to home alarm system devices and to avoid battery changes, a low power consumption is desirable. In the report, a suggested solution is to use the radar as second opinion to the PIR sensor, and to only activate it when the PIR has triggered. This would limit the operating time and save power. However, it would also cause the product to lose some of the advantages of radar.

The development in the field is rapid and the future for microwave radars is bright. The ability to detect an intruder despite tough weather conditions makes the sensor a great complement to or replacement of the currently used sensors.

References

Larsson. I. & von Plomgren. G., 2020, *Microwave Radar Implementation in Outdoor Home Alarm System*, Master Thesis at the Division of Industrial Electrical Engineering and Automation, Lund University.