

# Solutions for presence detection in an intercom door station.

Using a tiny radar sensor, it's possible to design a smart presence detection system that saves energy, extends product lifetime, and even enables gesture control in an intercom device. This radar sensor can be hidden behind many types of material and is small enough to be installed in wireless earbuds.

With global warming being an ever-looming threat, there is a need to decrease our carbon footprints. This can be done in several ways – from large changes like electrifying our current modes of transportation, to smaller things such as turning off devices when no one is using them. This project has examined different presence detection technologies to implement in a door station. In the same way that the lights in a public restroom only turn on for a limited time after someone enters, a door station can be built in a way that allows it to turn off when no one is close to it. This allows for lower energy consumption which not only saves on electricity but also increases the life span of the components.

The product this was tested on was an intercom door station, but the findings from this project would be applicable to other devices that face similar environments. To place electric equipment outside there is a need for weatherproofing. This gives rise to limitations when designing the parts of the door station that interacts with the outside world. Currently, a PIR (passive infrared) sensor is used to detect if there is any movement in front of the sensor. This is done by measuring if there is any temperature change in front of the sensor. A problem with PIR sensors is that they work much better at spotting if someone walks past the sensor than if someone walks towards it, this makes them prone to false triggers. Another problem is that IR light

can't penetrate most materials, this puts some very limiting requirements on the mechanical design of the product as a special plastic cover needs to be placed in front of the sensor to weatherproof it. This plastic cover is both difficult to source and difficult to get certified as a sealing material. The goal of the project was to find a different technology that solved these problems. To accomplish this goal, several different technologies and sensors were researched, tested, and evaluated. A type of radar sensor called "Pulsed Coherent Radar" that uses a frequency of 60 GHz was chosen. This sensor is very small and energy efficient. It can also be placed behind the intercom's hardened glass panel on the front with minimal impact on the ability to see and track people.

The reason radar sensors are a great solution for presence detection in this product is because of how easy it is to implement and the mechanical design freedom of the product it provides. There are also additional benefits, for example, because of the accuracy of the sensor, smart algorithms can be created that only wake the device up when a person is approaching the product. It can differentiate between someone walking away or someone walking past the product and filter those out. This makes the presence detection even more efficient. There is also a possibility of having gesture control with the sensor thanks to the high accuracy it provides.



Figure 1: An intercom device.