

Wheelchair Detection System for the Disabled

Abstract

This system is designed to replace or compliment existing methods of access for the physically challenged. The system can be tuned to object size allowing a door to be automatically opened for hand carts or wheelchairs. I can also be used to detect the presence of a person or object so when a building or business is closed it can be used as a warning system to let security know someone is there or to switch a camera automatically to view the area. The system uses an in-ground capacitive sensor to detect an object and its size. The sensor board output allows the sensor to compliment a button operated system or replace it completely. In a production environment a second sensor would be used so both entry and exit from the building would be handled. If placed on a ramp only one sensor would be needed. If however the unit is being used on a flat surface a second sensor could be used to detect direction. The prototype consists of the E-Field demo board, 25 feet of 2 inch aluminum foil tape used in heating and air conditioning systems, plastic enclosure, two conductor shielded cable, coax cable, male and female coax connectors, and a 32 x 28 inch polycarbonate sheet. Total prototype costs were about \$100. The flow diagram illustrates how a power assisted door currently works on the left and how the sensor alters this function on the right.

E-Field Assist System for the Physically Challenged

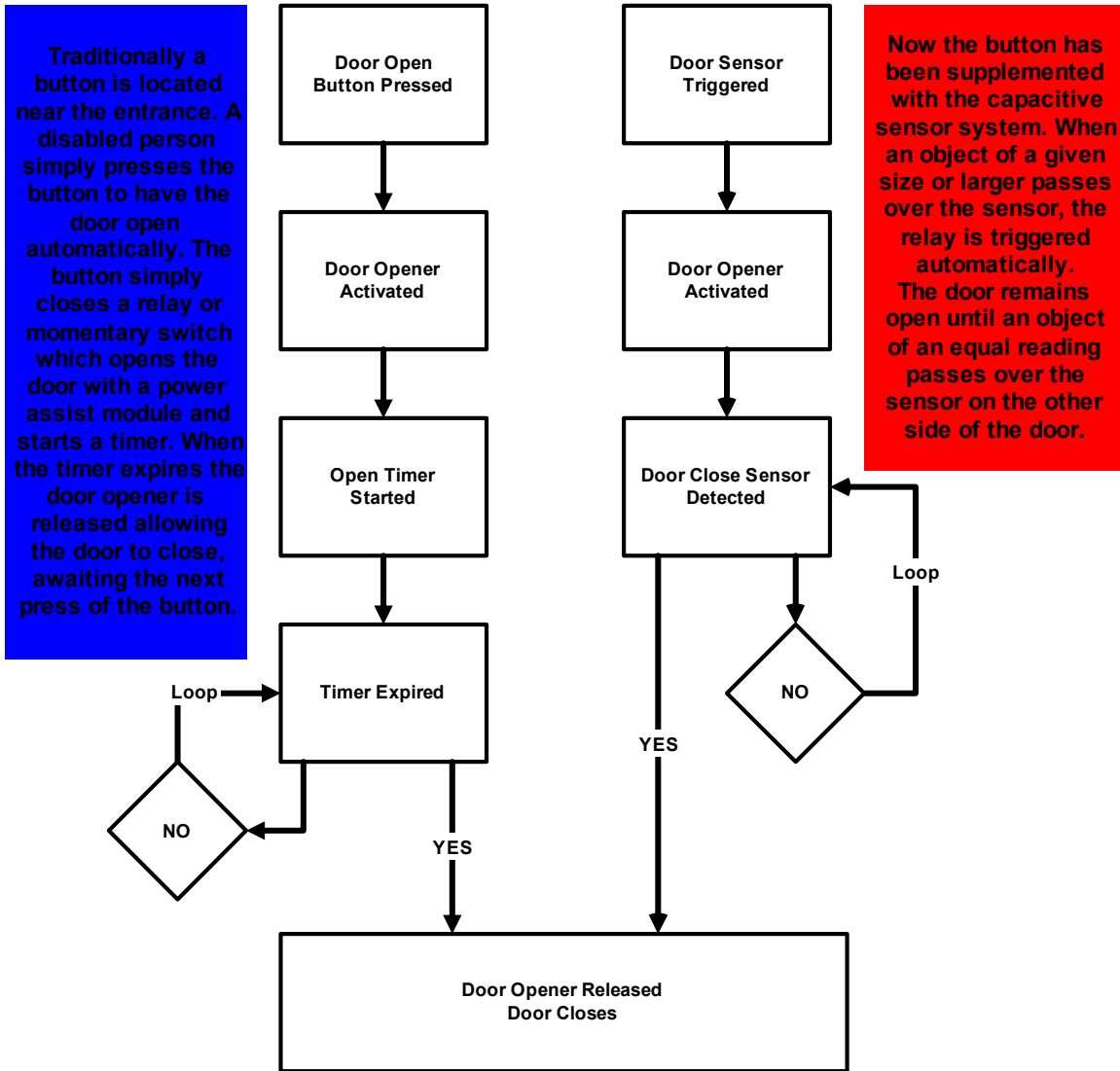


Figure 1-1

The unit can be connected in series with a current button assisted system or replace the current system. Due to the design the system can also be used as a simple presence detection system or to pan a camera for security purposes. Current systems employ a timer to hold the door open for a set length of time. By using a sensor on both sides of an entry, the door can be held until the object is detected over the second sensor. I placed the sensors about three feet from each side of the doorway. This allows for plenty of room for the door to open while keeping it close enough to detect passage. Once an object is

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detected that is similar in size to a wheelchair the relay is closed momentarily. Once object passage is detected the relay is again closed momentarily. The system compares the size of both objects so if a person walks through the passage while the door is opened the difference in size is detected and no action is taken. The granularity of the reading is adjustable so differences in environment can also be accounted for. The sensors each contain six electrodes. As a wheelchair passes over the sensors the outer pairs of electrodes detect the outer wheels of the chair. This reading is different than if a person walks over it or even a group of people. Sensitivity is adjustable so the system can always be adjusted. In addition to sensitivity the polling frequency and capacitive reference point base reading and base reading frequency can be adjusted. This will allow the system to account for changes in weather conditions and object speed. While I used aluminum tape, conductive paint could be used as a replacement. I was unable to obtain conductive paint in time for the project completion so this would need to be tested for durability before being put into use.