Parking Assist System Presentation

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Introduction

Parking assist systems are used in motor vehicles to alert drivers of obstacles while reversing. They are a hard real-time embedded system because missing a deadline may lead to catastrophic failure, a collision. My system utilizes an ultrasonic sensor and a buzzer to produce a range of audible updates, based on its distance from an obstacle.

Features

As previously aforementioned, my parking assist system features an ultrasonic sensor which determines distance from an obstacle and prompts a buzzer to beep at various frequencies. If the obstacle is 10-15 cm from the sensor, the buzzer will beep once per second. If the obstacle is 5-10 cm from the sensor, the buzzer will beep twice per second. If the obstacle is 0-5 cm from the sensor, the buzzer will continuously buzz.

Challenges

I faced many challenges while developing my parking assist system. One that immediately comes to mind is handling erroneous sensor data. The ultrasonic sensor would occasionally process inaccurate readings and produce a distance of 0 cm, which would immediately put the system in its final state where the buzzer is continuously buzzing. To overcome this I decided to ignore distances of 0 cm, and not change the system's state when they are encountered. This does not compromise the robustness of the system, as, with valid sensor readings, a distance of 0 cm is not possible, and, additionally, the ultrasonic sensor I used, the HC-SR04, is not rated for anything sub 2 cm.

Updates

I would like to add driver intervention to my parking assist system. For example, have the system apply the vehicles brakes to prevent a collision. I think this is the next logical step for my parking assist system. I would also like to add another sensor to the system because, when it comes to safety critical systems, redundancy is key.

Conclusion

I learned a great deal while developing my parking assist system, as it was my first time developing real-time software. I have gained exposure to priority-based tasks, concurrency, and software timers. This experience was invaluable to me and it certainly will not be my last time engineering embedded systems.