

Product Design Specification

*Post to github as a PDF. 2-3 pages, may include pictures.

Concept of Operations

A brief summary of your device. What does it do? Why? Who uses it? How do they use it?

For the Practicum project, our team has come up with a device named Automatic Braking Emergency Device. This Minimum Viable Product (MVP) has an ultrasonic sensor attached to a RaspberryPi. The sensor measures the distance by using ultrasonic waves. It emits an ultrasonic wave and receives the wave reflected back from a target. Therefore, it knows how close the object is in front of it. This product can be a part of any moving device since it can brake the device automatically when there's any obstacle in front of it.

Market Analysis

Who are the intended customers? What is the competition? Why is your product different? What price will you think you can sell this for, and why? (keep it short)

Intended customers: automotive companies seeking to incorporate additional safety features.

Competition: larger scale fully automated/autonomous systems : autopilot(tesla),...

Unique Features: simple, inexpensive, small, and useful. This device is widely applicable, since almost any system with safety measures could benefit from it, and performs reliably at low cost and with off the shelf components. This device makes use of a common ATmega processor and easily attainable Ultrasonic sensor to implement an accurate braking system that has the potential to save companies several thousand times more than the cost of the precaution device and its deployment/installation.

Price Point: ~\$20 for simpler purposes that do not require high precision readings nor have large amounts of money at stake. This ballpark price point is for the cost of all board materials and peripherals, engineering overhead/programming implementation, and for appropriate profit margin.

Requirements

Requirements are: Abstract, Verifiable, Unambiguous, Traceable, Realistic (r, you're defining the requirements, not the solution)

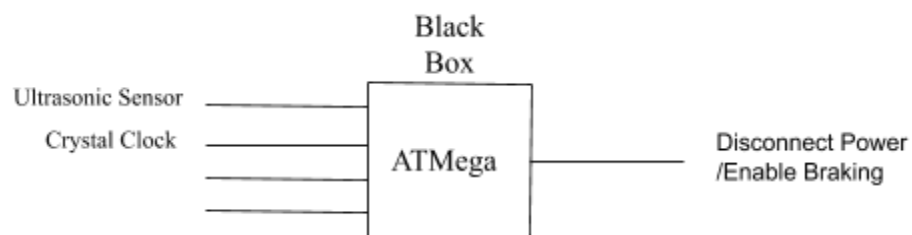
Requirements: Our microcontroller should have the ability to reliably stop within 5-10cm from any given obstacle based on input readings provided by the HC-SR04 Ultrasonic Sensor; the aversion algorithm/decision matrix programming will be written in the C language and will be deployed from ATmega328p processor. Ideally, this implementation should produce repeatable results with minimal resources for a large cost to benefit margin.

System Architecture

This is your proposed design, from a high level.

Create a Level 1 block diagram: one block per major section (e.g., processor, input, output, power supply, etc) with interconnections in between them. Label all interconnections.

Label all blocks. If it makes sense to put the part number in the block, go ahead.



Design Specification

A list of bullet points is fine here: What is the sensor? Processor? Actuator? Power? Mechanical design? Firmware? Arduino or no? Development environment?

- Sensor: Ultrasonic sensor HC-SR04
- Processor: ATmega328p
- Actuator: LCD1602
- Power: 2500mAh 20A Batteries
- Arduino: no
- Development environment: Arduino IDE