Motorcycle Proximity Sensor

Requirements Specifications

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Background

Motorcyclists are especially vulnerable on the road. They are exposed to the elements and a lot smaller than other traffic on the road. As such, other motorists do not always see them or pay attention to them when they do. This means it is necessary for a motorcyclist to always be aware of every car on the road whether they be in front or behind them. The proximity of a vehicle behind and to the sides of a motorcyclist determine the rider's lane position and riding style in order to ride safely and defensively. With the popularity of vintage motorcycles, café racers, and modifications to motorcycles a lot of riders are finding themselves with aftermarket rearview mirrors, if any at all. These aftermarket mirrors can be inconveniently positioned or possibly suffer from vibration making them hard to use effectively.

Objective

Our proximity sensor will give a visual representation of the distance of a vehicle from the rear of the motorcycle. This will be shown in three zones; close, near, and far with all zones within 15 feet of the rear of the bike. Optionally, there will be side sensors as well that show a detection of a vehicle in the rider's blind spot. The display will be mounted in the front of the bike near the speedometer where the rider does not have to take their attention from the road in front of them in order to know how close traffic is. This will give the rider a good indication of where to position themselves in the lane and what their current surroundings are.

Constraints

The display must be visible in all conditions and be durable enough to survive in inclement weather since it will be exposed. The power source is 12.6 VDC from the motorcycle lead-acid battery so it cannot draw more current than the motorcycle can give which is not a major concern. The unit will need to be compact so as to mount easily on the front of the motorcycle within sight of the rider.

Standards

The unit must comply with any sort of federal safety standards that may be in effect regarding sensors (RF, IR, Ultrasonic, etc.). There should be no communication or data standards needed in this implementation.

REQUIREMENTS SPECIFICATION		
Marketing Requirements	**Engineering Requirements**	**Justification**
5	The unit must detect an object at least 13 feet away with accuracy to +/- 3in.	The average car length is ~15ft and less than that is considered "close" for a motorcycle rider.
4	It must be able to be powered by a 12V DC source.	The unit will be powered from the 12V lead-acid motorcycle battery
3	The unit must light a display based on the distance of detected object in 3 zones; Close, Medium, Far.	The changing display will tell the rider how close a car is getting.
2, 3, 6	The display must be bright enough to be seen in full sunlight.	Time of day cannot restrict use of the unit.
2, 4, 5	The unit will be modular.	The display will be mounted up front and the sensors will be mounted in the rear.
3, 6	Display must update in real-time.	The rider must know how close an object is with no delay.
6	The unit must be weather-proof.	Motorcycles are exposed to all elements during operation and ridden frequently in inclement weather.
1	Total parts and manufacturing should not exceed $50.	The end-user cost should be low for a safety device in order to encourage sales.
5	The system should draw max current of 500mA.	The system should not be a considerable power drain on the motorcycle electronics system.
4, 5	The modules should be low-profile and easily mounted	Motorcycles are all different and do not have a lot of unused space to mount peripherals.
3, 6	The unit may have side sensors for blind-spot detection.	A rider must physically turn his head (and therefore) attention away from the road in front of him in order to check blind spots.

Marketing Requirements
1. The system should have an end-user cost of $100 or less.
2. The display should be visible in peripheral vision.
3. The system should tell the rider how close an object is.
4. The system should be physically small.
5. The system should be easy to install.
6. The system should be able to be relied on for physical safety.