RC Car 360 Degree Proximity Detection

Product Design Specification

Version 1.0

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Version history

Version #	Implemented by	Revision Date	Reason	Changes made
1.0	Group	10/24/15	Initial Draft	Full document synthesis
1.1	Group	12/9/2015	Updating specs	

Context: The device mounts on top of an RC car. It has a range sensor and spins around to detect objects. When objects get near it will notify the driver that it detects an object.

Class Requirement	Requirement	Justification
8	Must detect objects up to a distance of 80cm on the horizontal plane	Reasonable detection distance to react for operating RC car
8	Must not detect RC car	RC car should not interfere with detection
7	Must emit light when device detects object	Basic response to detection is easily obtainable
7	Must vary color depending on distance object detected. Red=close. Blue=detected. Green=nothing detected.	Gives better feedback on range to object detected
5	Must use digital microcontroller	Supported by class
	Must run off battery power	Permits mobility of RC car
	Must regulate power between battery and components	Makes sure components receive constant power through lifecycle of battery
10	Must be able to perform in an office environment	Informs required extremes for components
7	Must have device spin on top of car	Allows full 360 degree sweep of sensor
8	Must have on/off switch for spinning control	Allows setup without device spinning
1-4	Must be mounted on top of RC car.	Best vantage point for detection
8	Should detect objects inside detection threshold within 0.5 seconds	Need to have device react quickly enough for user to be able to compensate from feedback
1-4	Should be enclosed in a box	Part of project requirements and obtainable
9	Should have inputs labelled	Device usage should be clear to someone not familiar with the design of the product
8, 10	Should have power switch for device	For convenience of powering device
10	Should be able to withstand RC car impact into a wall at full speed	Worst case scenario with operation of RC car
	Should use IDE provided by microcontroller manufacturer	Part of project requirements
7	Should produce sound when object is detected inside the close threshold	Additional output allows better user experience

	Should stay powered for at least 10 minutes	Reasonable time for demonstration
8	Should have spinning control switch be read by microcontroller	Microcontroller needs to be able to control spinning following user input
8, 10	May have device power switch read by microcontroller	Microcontroller needs to follow user input to power off
7	May have display	Stretch goal to give more interesting feedback
7	May vary sound based on distance detected. Far=pulsed, close=solid sound	Allows user feedback on the distance of objects detected
7	May display range of object detected on display	Gives defined feedback to user
7	May turn off display when object not detected	Offered power savings

Class Requirements:

1. Must have PCB board for components to mount to
2. Must have at least 2 layers on PCB
3. Must have an area between 9 and 900 cm^2
4. No linear dimension <2cm or >30cm
5. Must have the microcontroller mounted to the PCB
6. Must have >25% surface mount components
7. 1+ Actuator
8. 1+ Sensor
9. Usable within 5 minutes
10. Has to be safe to use/operate

	Must have PCB board for components to mount to	Part of project requirements
	Must have at least 2 layers on PCB	Part of project requirements
	Must have an area between 9 and 900 cm^2	Part of project requirements
	No linear dimension <2cm or >30cm	Part of project requirements
	Must have the microcontroller mounted to the PCB	Part of project requirements
	Must have >25% surface mount components	Part of project requirements
	Must be assembled by hand	Part of project requirements
	Must be tested to meet criteria	Part of project requirements
	Must function as specified	Part of project requirements
