RC Car 360 Degree Proximity Detection

Product Design Specification

Version 1.0

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Version history

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| 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 |  |
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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.

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| 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 |
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