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 |
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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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| Requirement | Justification |
| Must detect objects up to a distance of 80cm on the horizontal plane | Reasonable detection distance to react for operating RC car |
| Must not detect RC car | RC car should not interfere with detection |
| Must detect objects inside detection threshold within .5 seconds | Need to have device react quickly enough for user to be able to compensate from feedback |
| Must emit light when device detects object | Basic response to detection is easily obtainable |
| Must vary color depending on distance object detected. Red=close. Blue=far | Gives better feedback on range to object detected |
| 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 |
| 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 |
| Must be able to perform in an office environment | Informs required extremes for components |
| Must be able to withstand RC car impact into a wall at full speed | Worst case scenario with operation of RC car |
| Must have device spin on top of car | Allows full 360 degree sweep of sensor |
| Must have on/off switch for spinning control | Allows setup without device spinning |
| Must be mounted on top of RC car. | Best vantage point for detection |
| Should be enclosed in a box | Part of project requirements and obtainable |
| Should be able to be used within 2 minutes on first usage | Controls should not be too complex |
| Should have power switch for device | For convenience of powering device |
| Should use IDE provided by microcontroller manufacturer | Part of project requirements |
| Should produce sound when object is detected | Additional output allows better user experience |
| Should vary sound based on distance detected. Far=pulsed, close=solid sound | Allows user feedback on the distance of objects detected |
| Should stay powered for at least 10 minutes | Reasonable time for demonstration |
| Should have spinning control switch be read by microcontroller | Microcontroller needs to be able to control spinning following user input |
| Should have device power switch read by microcontroller | Microcontroller needs to follow user input to power off |
| May have display | Stretch goal to give more interesting feedback |
| May display range of object detected on display | Gives defined feedback to user |
| May turn off display when object not detected | Offered power savings |