90 - /100

Grading Criteria

20 points — General document guidelines
- --Title
- -- Authors
- -- Version and/or date
- -- Page numbers (if more than 2 pages)

10 points — Organization
- --What is proposed project?
  - -- If relevant: Background? Objective? Need?
- --Requirements grouped together logically
  - -- Functionality, Performance, Economic, Energy, etc…

50 points — Attributes of requirements
- --Abstract (specifies "what" not "how")
- -- Verifiable (possible to measure or verify requirement met)
- --Unambiguous (single, unambiguous meaning; short, clear statements)
- --Traceable (traceable back to marketing requirements)
- -- Realistic/Justified (technically feasible)

20 points — Completeness and Relevance
- --Minimums: PCB size, maximum parts cost, can assembled by hand
- -- can be designed and built in less than 10 weeks
- -- at least one sensor, at least one output/transducer
- -- requirements relevant to specific project proposed

ECE411 Project

Hand Clap Sound Activated Relay

Requirements Document

Group members:

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Version 2.1

Prepared by: Peter, Han Le
Reviewed by: Robert
Revised by: Robert, Phuong Ho

Date: 10/18/2013

Table of Contents

Revision History:

Name	Date	Reasons For Change	Version
Han Le	10/18	Create 1st version	1.0
Peter Depeche	10/18	Editing	2.0
Robert	10/20	Editing	2.1
Phuong Ho	10/22	Editing	2.2

I. Needs Identification

- Convenient and save time to control 3-way light bulb without manual remote control device or pushing buttons.
- Easy for users.

II. Objectives

This project is to design a Hand Clap Activated Relay which controls the 3-way light bulb (read reference about 3-way light bulb to learn this light bulb). The light bulb can be turned ON, turned OFF or changed its intensities based on the number of hand claps. This device must have low cost, wide range remote, stability…

III. Background

- Operating distance range: 0 – 4m
- Cost: < $30
- Size: 5inch x 5inch x 2inch
- Integrate inside or outside device: Outside
- Integrate before or after or both finishing: Before
- Compete with other control methods: easy to use without any additional devices such as: remote control, switch,..

IV. Requirements

1. Look, Feel, and Use Requirements

1.1 User Interface Requirements

The Hand Clap Sound Activated Relay is intended for all users. Thanks to this device, the typical users do not need any skills or special training sessions in order to run the device and get it to function. With one, two or three hand claps, the users can control the light bulb as their desires.

1.2 Ease of Use Requirements

Typical users should be able to use the Hand Clap operated switch out of the box without reading manual or user guide. The label on the back of device should contain the number of claps associated with their outcomes (light intensity).

2. Marketing Requirements

2.1 Marketing Overview

The initial production of the Hand Clap Sound Activated Relay is not intended for commercial sales and distribution. However, if the final design reaches high level of acceptance from the viewers, distributing our design into commercial sales might be considered. As of now, the marketing evaluation is limited by cost and availability of parts, and high competition (plentiful companies have already made similar products).

2.2 Marketing Analysis

- Parts needed to complete the design must be available (in-stock)
- Cost/unit of parts must be less than or equal to $30
- The final cost/unit can be significantly reduced based on the volume price for each component of the design and reduced costs of mass-production.

3. Operational Requirements

3.1 Technical Overview

- Input (sensor: microphone)
- Output (transducer): relay that drives the light bulb.
- Processing module: Atmel AVR ATMega328
- Parts can be hand soldered
- Two layer PCB (1 up to 16 in^2)

what, not how

3.2 Technical Requirements

- Product must be powered by regular 110 - 120 VAC power via regular male power connector.
- Use common three-way light bulb of maximum 200 Watts.
- Light bulb can be energized wasting tungsten type (old type) or the toxic for the environment mercury vapor type (the latest economic popular bulbs).
- The light bulb will be attached to the system by regular light bulb spiral screw-type socket.
- Respond to hand claps: turn on or off the light bulb based on number of hand claps.
- One hand clap must not cause any changes in light brightness: must not turn the light on or off. This condition is important for robustness against noise and interference.
- Four or more successive hand claps will be treated as three successive hand claps.
- Time interval between two or three successive hand claps is what a normal and reasonable person of average intelligence would use when s/he claps her/his hands while instructing "clap your hands twice", or "clap your hands three times".

→ ok for marketing — for engg must be measurable - e.g. up to 2 seconds between claps

(kind of complicated, just say time interval between 2 or 3 successive hand claps is based on the normal rate)

- Temperature operating range: Standard Commercial, 0 °C to 70 °C (32 °F to 158 °F).
- Must have input (sound) sensitivity level adjustment knob.
- Must NOT be easily confused by noise such as door slam, dog bark, child crying, and explosions in a movie on TV, cough, and such similar noise interferences.
- Must NOT cause interference to nearby electrical devices and appliances such as radios, TV, computers, medical devices, etc.
- Operating environment: device should operate in normal operating environment such as home, office, business, factory, etc. Device is not water proof, not shake or shock proof.
- Power consumption should be almost the same as of light bulb. Power consumption of the control circuit is negligible.
- If the light is turned on, it should remain on, forever, without any input signals (hand claps).
- If the light is turned off, it should remain off, forever, without any input signals (hand claps).

3.3 Safety Requirements

The Hand Clap Sound Activated Relay has a part dealing with 110V-220V AC interface which is considered dangerous for humans. This part has to be sealed in the box. Users need to be warned about this interface before operation of the device.

V. References

Faust, M., *ECE411 Industry Design Processes.* http://web.cecs.pdx.edu/~faustm/ece411/

Ford, R, Coulston C, (2008) ——— ? is this supposed to be a citation for the textbook ?

3-way lamp. http://en.wikipedia.org/wiki/3-way_lamp