

Semester Project Proposal

E C E 315: Introductory Microprocessor Laboratory

Accelerometer alarm

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Project Introduction

The Accelerometer Alarm is a mechanism that is designed to prevent theft of expensive items. It is small enough to be mounted via screwdriver and comes with a “protector box” to protect the PCB from any external damage. This alarm can be used by storage companies to detect theft or by property owners paired with a number pad through an optional I2C bus to detect uninvited security breaches.

The Accelerometer Alarm will consist of a 3.5” by 2” board with the designers’ names on the top right side of the screen. There will be an array of 3 Warning LEDs indicating a change in acceleration and a switch in order to determine whether the board should be active or not. The accelerometer would be mounted to the left side of the board and the board will be in a protective 3.5” by 2” by 1 cm casing with only the switch and LEDs in display with the group names printed on the outside of the board.

The Accelerometer Alarm will be controlled by a STM32 microprocessor. The processor will interface with an accelerometer via an I2C to detect movement and will contain a USB-UART bridge that will be used in the development of the software. The processor will communicate with a user through LEDs and an alarm sound output that can be only turned off when the board is not moving.

Essential Components

Power

Power will be supplied by a 3.7V coin cell (2032) lithium ion battery. A linear regulator will be used to generate a 3.3V main supply voltage for all of the components on the board. Alternatively, the linear regulator can be supplied from the micro USB port.

MCU

A STM32F303K8T6 Cortex-M4 microcontroller will be used to read the accelerometer and control the

LEDs and buzzer. The STM32F303K8T6 has 64KB SRAM and is capable of running at 72MHz. The application code running on the MCU will be written in C.

Accelerometer

The accelerometer will be used to detect any movement of the board. The sensor used will be the STM LIS3DH. It is a low power I2C 3 degree of freedom accelerometer that can generate an interrupt to the MCU when motion in any direction exceeds a threshold. The MCU can configure and read new values from the sensor using I2C.

Buzzer

A buzzer is used to produce a sound when movement is detected to alarm anyone nearby that the device is being tampered with.

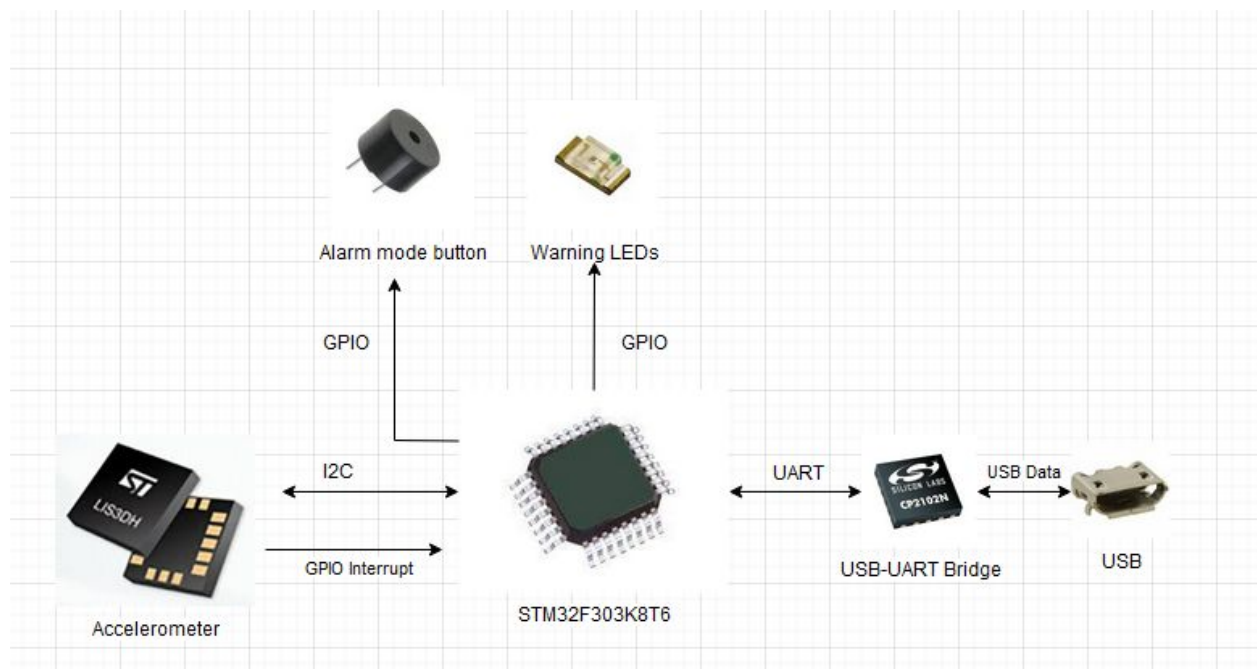
Warning LEDs

8 LEDs will be placed around the edges of the board, and will flash when movement is detected. They will be connected in a total to one GPIO as a set of 4.

USB-To-UART Bridge

The UART-to-USB bridge will be connected to one of the MCUs UART bus. It will provide a serial debug interface that can be used during software development. This will allow a PC to interface with the MCU through a micro-USB port. The micro-USB port will also be able to power the device.

Block Diagram



PCB Visualization

Note: All ICs and other components will be located on the back of the PCB.”

