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BRUFACE BRUSSELS FACULTY OF ENGINEERING

VRIJE UNIVERSITEIT BRUSSEL

Sensors and Microsystem Electronics

Microcontroller project: Themerin

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1 Manual

The microcontroller project consists of a game where one tries to play the right note at the right time. The main goal is to stay within the bounds shown on the screen. Points are given based on how well the player can stay in between these two bounds.

Here is an overview of how the game is played:
When the game starts, first a start screen is shown. It shows "PRESS A TO START". When "A" is pressed, the game starts.

The player plays the game by moving the joystick up or down and by pressing the "C" button. The joystick controls the frequency at which the buzzer makes a noise and also controls the position of a pixel on the left side of the screen. The "C" button activates the buzzer when it is pressed. So the buzzer will not make a sound when "C" is not pressed.

Lines will show up on the screen moving from right to left. For the continuation of this manual, they will be called borders. The goal of the game is to play the buzzer at the right time and right frequency such that the pixel that is controlled by the joystick stays within the borders shown on screen. Playing the right note at the right time gives the player points.

Once all borders have passed on the screen, the score will be shown on screen. Pressing "0" returns back to the start screen.

Note that points are given if a note is played at the right time and frequency but no points are subtracted when the player keeps playing the buzzer when they should not. Also note that the game can be reset anytime during playing it by pressing the "0" button. This resets the score and position of the boundaries.

2 Block Diagram

The block diagram of the microcontroller is shown in figure 1. Below is a list that explains each block:

- Joystick: Joystick present on the microcontroller
- ADC: Analog to digital converter
- Frequency and joystick position discretisation: The different values of the joystick is discretised into 12 intervals. These intervals correspond to a note ranging from C to B. Each note corresponds to a position on the screen with C the bottom of the screen and B the top of the screen.
- Timer0 interrupt: Timer0 duration is controlled by the position of the joystick.
- Buzzer Frequency: Frequency at which the buzzer makes noise.
- Joystick and tail drawing: Using the input of the joystick, a matching position is drawn on the screen. When the buzzer is playing ("C" is pressed) a tail behind this position going from right to left on the screen, is drawn.
- Button "C": Button "C" on the keyboard.
- Buzzer enable: Enables the buzzer if "C" is pressed and the game is being played. The buzzer does not work during the start screen or score screen.
- Button "A": Button "A" on the keyboard.
- Button "0": Button "0" on the keyboard.
- Start/Stop: This block controls when the start screen/game screen/score screen is shown.

- Character Buffer: The characters that are shown on screen during the start screen and score screen are stored in the program memory (FLASH).
- Border drawing: This block decides if a pixel should be on or off based on the position and length of the borders. The position and length can be found in the program memory (FLASH).
- Border edge calculator: recalculates the length of the borders when they go outside of the screen limits.
- Timer1: Controls the speed at which the borders and tail are moving from right to left on the screen.
- Score calculator: Checks during each Timer1 interrupt if the score should be increased.
- Display: Display present on the microcontroller.

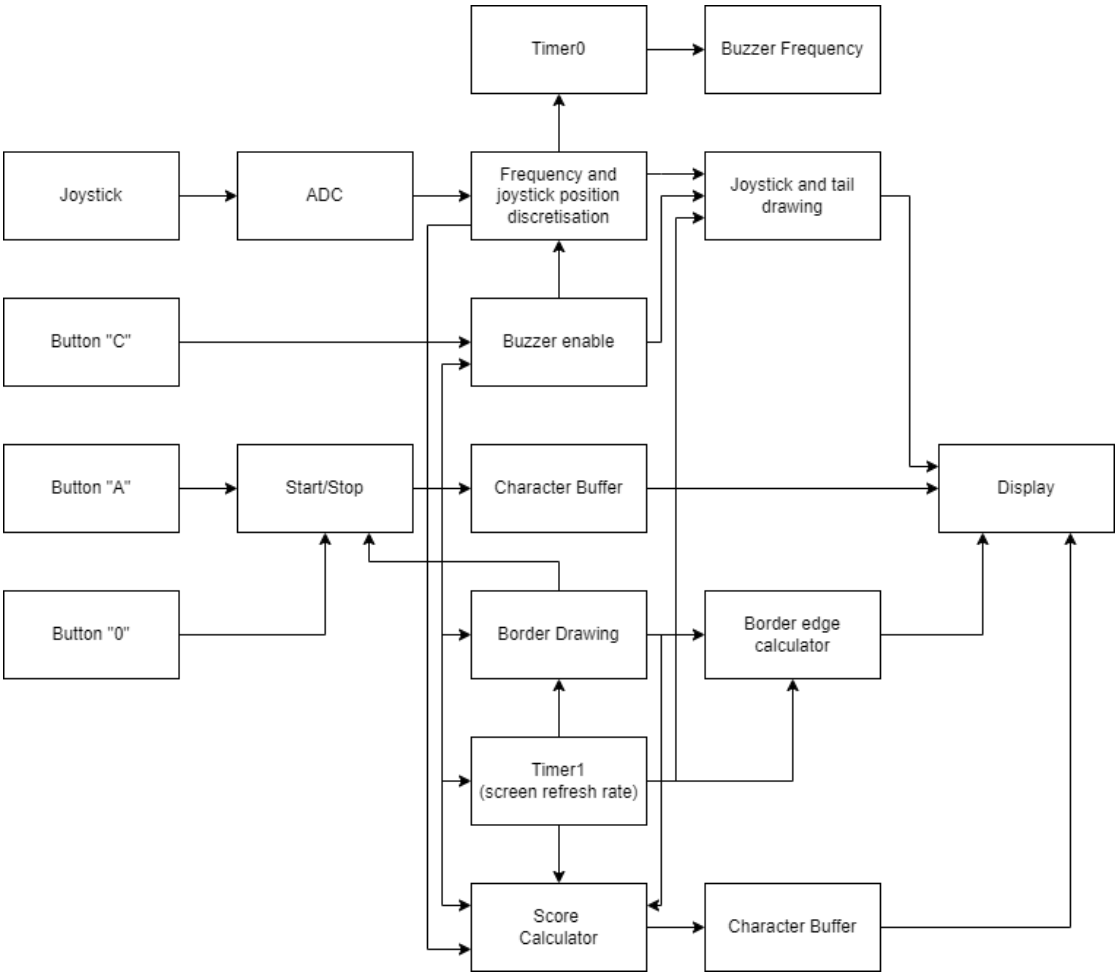

Figure 1: Block diagram of the microcontroller