Exercise 2: ADC Robotic Sweeper Simulation

Description

The purpose of this laboratory exercise is to simulate the operation of an ADC robotic sweeper that moves within an empty room. Starting from one corner of the room, its objective is to trace the outline of the room. The sweeper uses sensors to detect the distance from obstacles, with values measured by an Analog to Digital Converter (ADC). If a sensor value falls below a preset threshold (between 1-254), the sweeper will stop and turn left. If the right sensor detects no obstacle (value above the threshold), it will move right. The process continues until the sweeper returns to its starting point, where it stops. Additionally, if a switch is pressed, the sweeper performs a 180-degree turn and returns to its starting position, following the same path.

Assumptions

- Movement is simulated with an LED (when moving straight, LED1 is on; otherwise, it is off).
- The board has only one ADC, so it alternates between checking proximity to a wall and the presence of a wall to the right.
- Right and left turns are simulated by turning on LEDs (LED0 for right, LED2 for left).
- If Switch 5 is pressed, the sweeper performs a 180-degree turn and follows the same path in reverse.

Implementation Details

The ADC operates in two modes:

1. Single Conversion Mode: Measures from the side sensor initially.
2. Free-Running Mode: After T1=1s, continuous measurements are taken from the front sensor for T2=2s. These modes alternate cyclically until the room outline is completed.

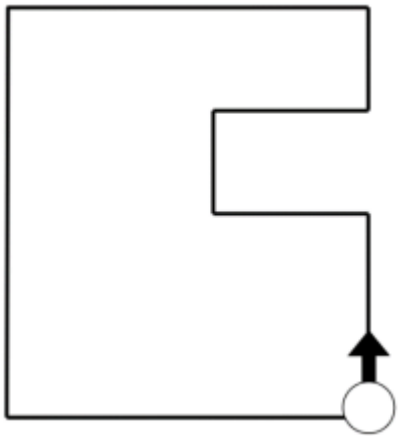
Reverse mode is triggered by pressing Switch 5, which is simulated with three LEDs (LED0, LED1, LED2) turning on for a short period. The sweeper then retraces its path using the same ADC modes in reverse.

Exercise Questions

1. Implement the movement logic for a square room with 90-degree angles (no need for the right sensor).
2. Implement the movement logic for a room with two obtuse (270-degree) angles, where the

second function of the ADC is introduced.

3. Implement the reverse function.



A picture of the room