Juan Tarrat

LAB 3 REPORT

1. THEORY TOPICS

- **Debouncing:** Debouncing is a small delay that is used to ensure the signal detected when activating a switch is valid. The switches generate some noise that may confuse the program and may led to errors. That is why we include this delay. The correct procedure in a program is to check if it has been pressed, then apply the delay and then check again for the signal. In this way you are double checking if the signal is correct avoiding the mistakes when executing it.
- **Software delays:** These are used, in this lab for example, to determine the time you want a led to be on before switching to an off state. It is a way to measure the speed of execution. An easy way to implement delay is with an empty for loop that loops the amount of times needed. Knowing the amount of clock cycles needed for one iteration of the loop and knowing what frequency you want, you can calculate the number of iterations using the formula *delay = clock cycles * x(number of iterations) *1µs* which is equivalent to
  *2*frequency = clock cycles * x(number of iterations) *1µs*
  The first thing I did was find the clock cycles it takes for my program to execute the for loop needed for the delay. I did this by experimentation really. I used a metronome I found on the internet and use the 10 clock cycles that are shown in the lab. With this and the metronome beeping at 60bpm (1bps) I determined that my for loops take 40 clock cycles. Knowing this the only thing left was to determine the number of iterations needed to adjust the frequency wanted.

2. PROGRAM 1

a. I found out that one iteration were 40 cycles. This means that the only thing left is knowing the iterations needed.

   Using the formula *delay = clock cycles * x(number of iterations) *1µs*

   I found that for a delay of *1s (2Hz) = 25000* iterations where needed and then the rest was just to multiply depending on the frequency I wanted. For example for 8Hz = 2 * 4 → then we need 100000 iterations and the same for 5 Hz. If we know that 1 Hz are 12500 iterations then 5Hz are *12500 * 5 iterations = 62500*.

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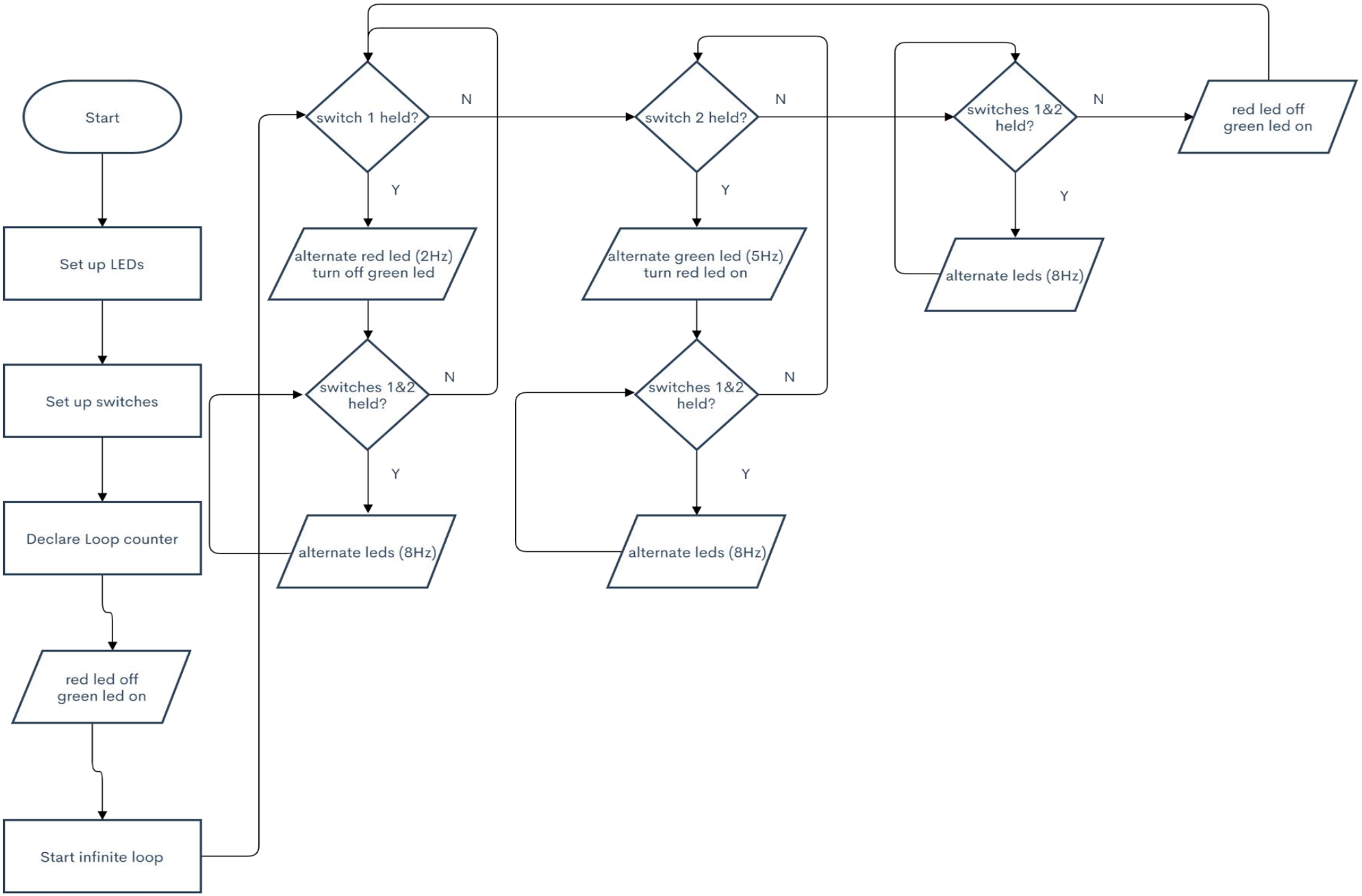
Start
Set up LEDs
Set up switches
Declare Loop counter
red led off
green led on
Start infinite loop
switch 1 held?
N
Y
alternate red led (2Hz)
turn off green led
switches 1&2
held?
N
Y
alternate leds (8Hz)
switch 2 held?
N
Y
alternate green led (5Hz)
turn red led on
switches 1&2
held?
N
Y
alternate leds (8Hz)
switches 1&2
held?
N
Y
alternate leds (8Hz)
red led off
green led on