T.C.
DOKUZ EYLUL UNIVERSTY

FACULTY OF ENGINEERING

DEPARTMENT OF COMPUTER ENGINEERING

2022 – 2023
SPRING SEMESTER

CME 3208
PRINCIPLES OF EMBEDDED SYSTEMS

LAB 5:
MOTION SENSOR LIGHT WITH TIMER

DUE DATE:
23:55 – 11.04.2023

In this lab you are asked to create a light (represented via a LED) using "HC-SR501 Integrated Motion Sensor" as activation key and using "14 mm Seven Segment Display" to display remaining time until turning out the light.

Compare this system to motion sensor lights or lamps that you have seen in buildings. When motion sensor detects a movement, it turns the light on and waits a previously determined time before it turns the light off and returns to its initial state, waiting for activation again.

While using "HC-SR501 Integrated Motion Sensor", you may require to set certain variables concerning activation distance, location or speed. Try to declare these values as global variables so that you can change them easily to make it work better.

You can use a single LED to represent light in this experiment. Just turn it on when motion sensor activated and turn it off when the wait time has passed.

"14 mm Seven Segment Display" is used to show the remaining time until light is turned off. As you know, it can be used to represent decimal or hexadecimal values. However, showing larger values may not be possible. Assuming we choose a larger wait time, we can create a circle animation through "a" to "f" segments, similar to busy mouse pointer animation in operating systems.

Try to make your circuit elements as distant as possible from each other and make sure there are no jumper wires over circuit elements that prevent the correct working of sensors or other input devices.

You should use the following global variables in your code to make it more readable and modifiable.

int TIMER_START = 30;
// This variable is used for how long our LED light should be turned on, where 30 represents 30 seconds. You can also use "30000" to represent it in milliseconds.

int TIMER_SPEED = 500;
// This variable is used for how long a second should be in your circuit. Even though it should be 1000 to make it factually correct, it is selected as 500 (milliseconds) to make your timer goes faster for easier development and video taking purposes.

int ANIMATION_SPEED = 200;
// This variable is used for how long a single part of animation should be displayed. Alternatively, you can assign it to 100 (milliseconds) to make it faster.
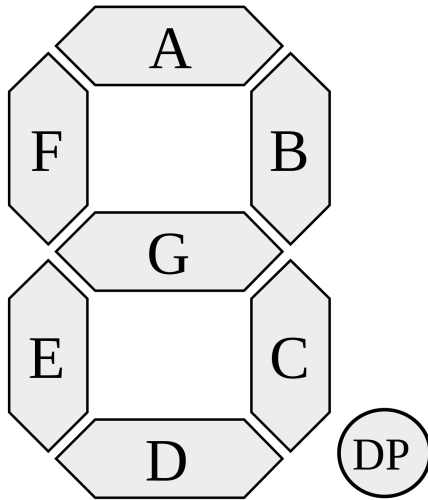
Considering the 7 segment display image above, your animation should be a single light part moving from A to F in a clockwise direction (A, B, C, D, E, F, then starting from A again). In addition to this animation, you are free to implement any alternative animation you wish.

Your program should work (given the global variables above) like the following, when it detects a movement, it will turn on the LED and start to count from 30 to 0. During this, until reaching 15 (hexadecimal F), it will print a rotating animation on 7 segment display, turning on clockwise direction. When the countdown reaches 15, it will print "F" and until reaching zero, it will print the hexadecimal value of remaining time from "F" to 0. When it reaches to 0, it will turn off the LED and 7 segment display.

UPLOAD REQUIREMENTS:

You are required to upload three different files for this assignment. First is a text file that contains your source code for your circuit. Second is a Tinkercad screenshot showing your circuit after your design is finished. Third is a video file showing your circuit that has been created using lab supplies. Only one of the group members can make an upload, there is no requirement for all members to do a separate upload of same files.

For your video, you are expected to introduce yourself and your teammates, showing your student IDs in video too. If your group are working online rather than meeting in real life, you do not have to show the ID cards of students who are not physically present.

You are also expected to explain your circuit in a brief but complete manner and show its execution. This video should not be too long (a maximum of 3 to 5 minutes is acceptable) and should not be too large otherwise you will not be able to upload to Sakai (check the maximum allowed file size for upload to Sakai). You should also consider choosing resolution 720p over 1080p or larger for smaller file size (make sure your circuit is still visible and understandable over this resolution). You can also change your video format to a more space efficient one.

You should show the effects of changing every global variable that is mentioned above in your video. Again, please do not consider too many different values to make a too detailed video, just show the effect of changing that particular global variable.

If you experience problems with your circuit and cannot make it work, show your design in Tinkercad and your circuit at the same and explain what is the problem and what might be causing it in your opinion.

The naming of your files should follow the format below for 3 person groups. For 2 or 4 person groups just write 2 or 4 student numbers in ascending order. You should write your group numbers with one leading zero if it is between 1 and 9, normally for 10 and above.

The file extension for screenshot (Tinkercad) and video does not have to be "jpg" and "mp4", you can use other formats as well like "png" or "mkv" or etc. However, make sure you use commonly used image and video formats, if we cannot open it on our computers, you grade related to them will be zero. In addition your source code file extension could be either "c" or "ino", do not leave it as "txt".

Do not "zip" or "rar" requested files and upload them. It is not necessary and it makes it harder for us to evaluate your assignments. Please upload 3 files as they are without compressing them to a single file.

FORMAT:
GROUP_<group_number>_<student_number_1>_<student_number_2>_<student_number_3>_CODE.c
GROUP_<group_number>_<student_number_1>_<student_number_2>_<student_number_3>_TINKERCAD.jpg
GROUP_<group_number>_<student_number_1>_<student_number_2>_<student_number_3>_VIDEO.mp4

EXAMPLE:
GROUP_01_2023510123_2023510124_2023510125_CODE.c
GROUP_01_2023510123_2023510124_2023510125_TINKERCAD.jpg
GROUP_01_2023510123_2023510124_2023510125_VIDEO.mp4

You are expected to write your own code for algorithms instead of using an available method for calculations. If you use such as a method that makes this assignment trivial to code, your grade for coding will be zero.

Your uploaded source codes (as well as your circuit design) will be checked for cheating and plagiarism. If cheating is detected, your entire assignment will be graded zero. If you or other students copy your code from an online source rather than writing it yourself, it will be considered as cheating as well.

Make sure that you upload your correct assignment to correct upload section. If you accidentally upload another assignment (from another class for example) or to an incorrect upload (other section's upload), it will be considered as not turned in and it will be graded as zero. Worst of all, you will only realize it after grades are published and it will too late to fix it.

If you have any questions or problems regarding this lab paper, you can ask about it in our lab sessions. If you wish, you can also ask it in class forums or assignment page comments. If you send an email and if your question is answered, please share this information with other students to prevent asking of the same question again and again.

Your assignment will be open for upload until 23:55, 12.04.2023. This is done to allow students who may experience extreme problems (no Internet or electricity, computer crash or failure, etc.) and miss the deadline as a result. This one day extension will allow them to upload. If you are still unable to upload, send us an email informing your situation and at the same time, try everything you can to make your assignment upload.

Lastly, please do not forget to click "Submit" button after you upload your assignment files. If you do not, even though your files are uploaded to Sakai, you are labeled as "No Submission" and ignored when we try to download your assignments, making your uploaded files invisible to us, leading us to assume you did not make an assignment submission.

GOOD LUCK TO YOU ALL!