Actuators

Team: Los simuladores

🏆 A.2.2 Learning Activity

Objective

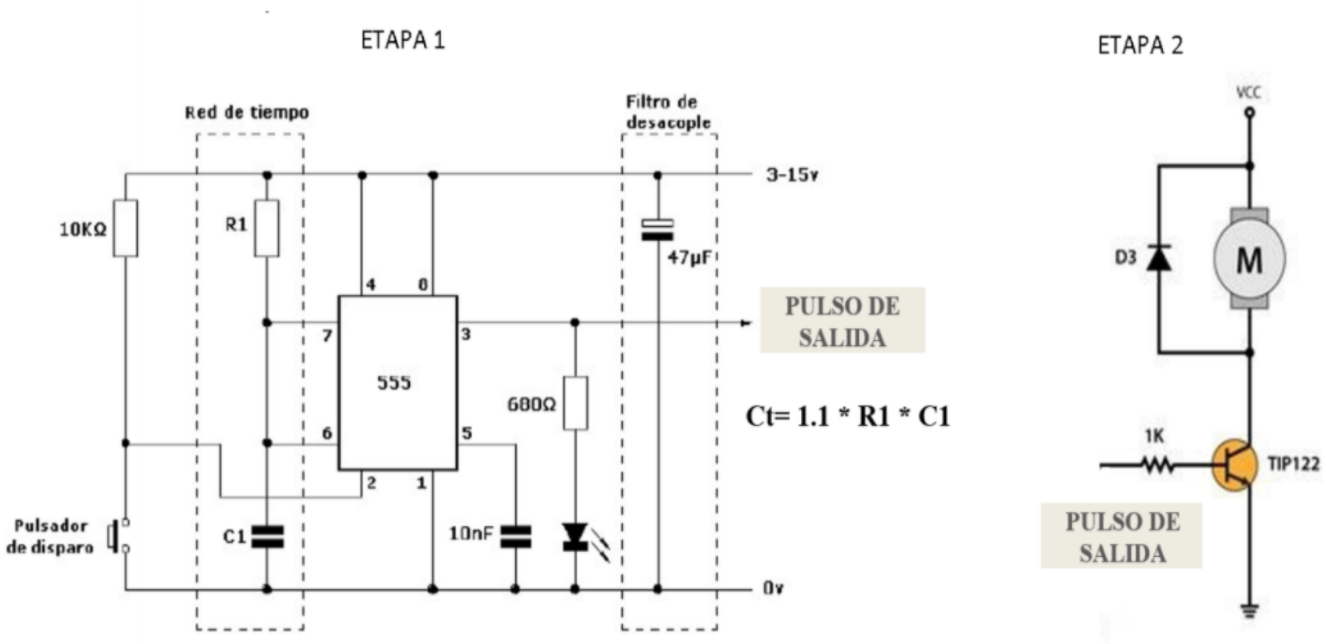
Perform a start-up and ignition control system for an electric actuator via an electronic circuit, using a simulator, a NE555 Timer and a DC Motor.

✏️ Development

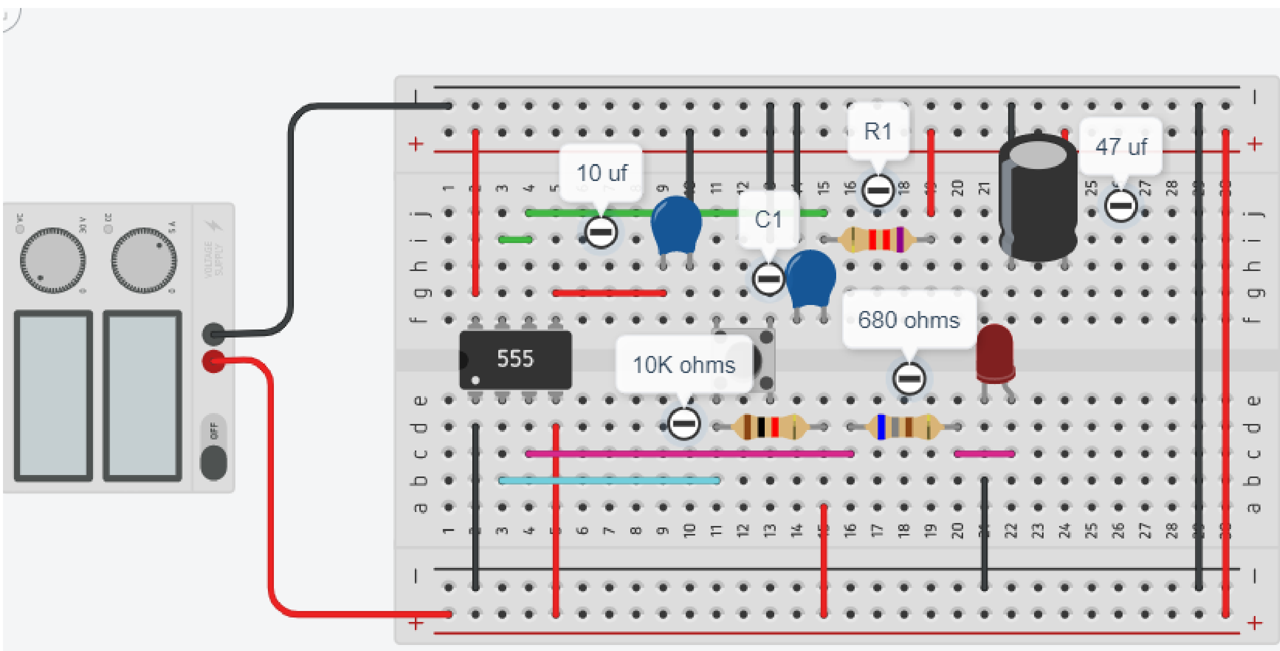
1. Use the following list of materials for the development of the activity

Quantity	Description	Reference source
1	Integrated circuit NE555	Datasheet
1	Electrolytic capacitor of 47uf	Datasheet
1	Ceramic capacitor of 10nf	Datasheet
1	Power Supply of 9V	Shop place
1	Power transistor TIP122	Datasheet
1	Diode 1N4001 or the equivalent	Datasheet
1	Mini Motor DC	Shop place
3	Resistors 680,1k,10k Ohmios of 1/4w	Shop place
1	Push button	Shop place
1	Red led diode	Data sheet

2. Use the electronic circuit in the picture below and assemble stage 1 using the simulator.



- Simulated stage 1



3. As you can see in the previous circuit there is an area identified as "Time Network" and another "Decoupling Filter", explain the purpose of both terminologies.

   - The **time network** is the one that allows us to establish by means of an arrangement of a resistance and a capacitor, the time in which the charge signal will be active at the output of the NE555

   - The **decoupling filter** serves to reduce the noise at the input of the DC signal and to have a better resolution of it

4. Continuing with the previous image, observe the equation Ct = 1.1 * R1 * C1, Which is used to set the time for the output pulse. Based on the above equation, calculate the values of R1 and C1 if you want to keep the output pulse on, given the 3 conditions required in the attached table.

- Calculations

  From the formula Ct = 1.1 x C1 x R1, we clear one of the variables in this case R1 (resistance)

  The formula will be as follows:

  ```
  R1 = Ct / (1.1 x C1)
  ```

  Now we can use this formula and by giving values to C1 we will obtain the value of R1 with respect to the time it takes

  - 3 second calculation

    ```
    Ct = 3 sec
    C1 = 1000 uf
    R1 = 3 sec / (1.1 x 1000 uf)
    R1 = 2 727 ohms = 2.7K ohms
    ```

  - 5 second calculation

    ```
    Ct = 5 sec
    C1 = 1000 uf
    R1 = 5 sec / (1.1 x 1000 uf)
    R1 = 4 545 ohms = 4.5K ohms
    ```

  - 8 second calculation

    ```
    Ct = 8 sec
    C1 = 1000 uf
    R1 = 8 sec / (1.1 x 1000 uf)
    R1 = 7 272 ohms = 7.2K ohms
    ```

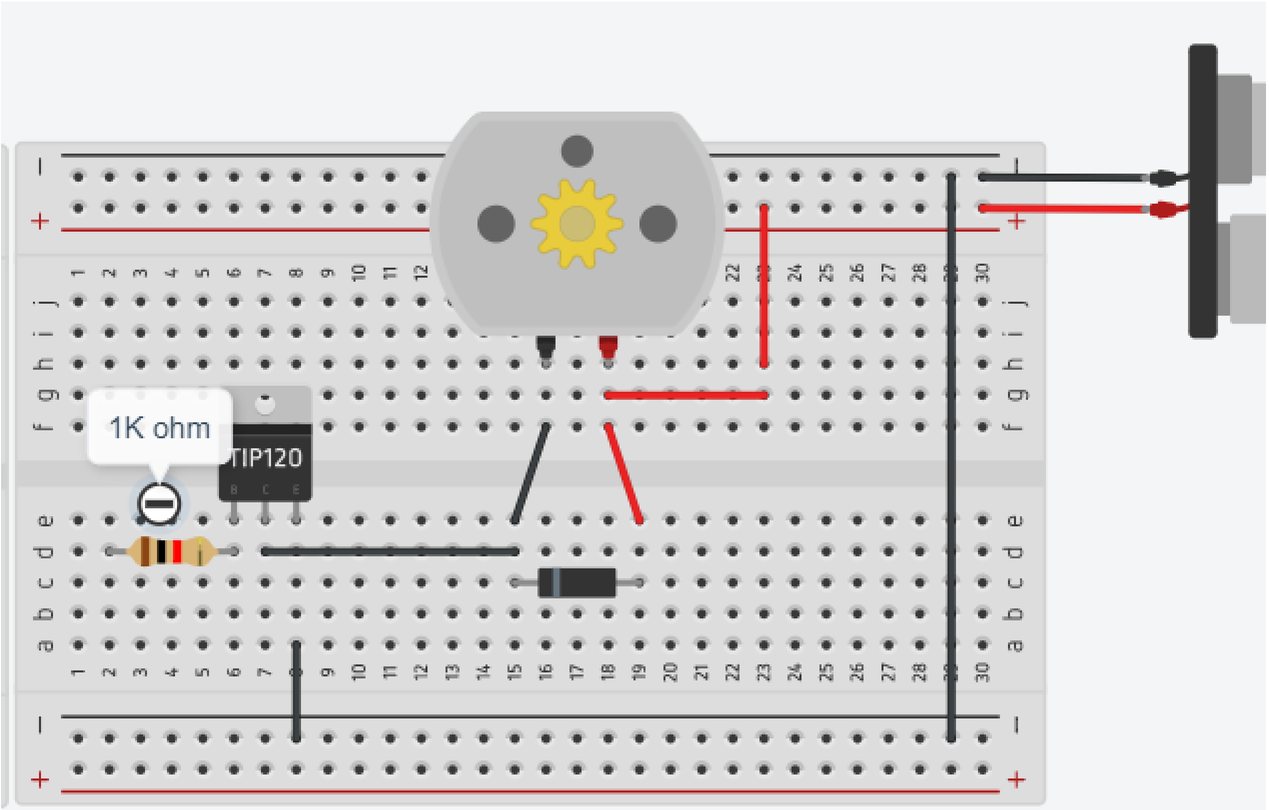
Number	Condition	R1 value	C1 value
1	3 seconds	2 727 ohms	1000 uf
2	5 seconds	4 545 ohms	1000 uf
3	8 seconds	7 272 ohms	1000 uf

5. Once the above table is completed, start the simulation for any of the three conditions and observe the behavior of the Led; **explain your observation**.

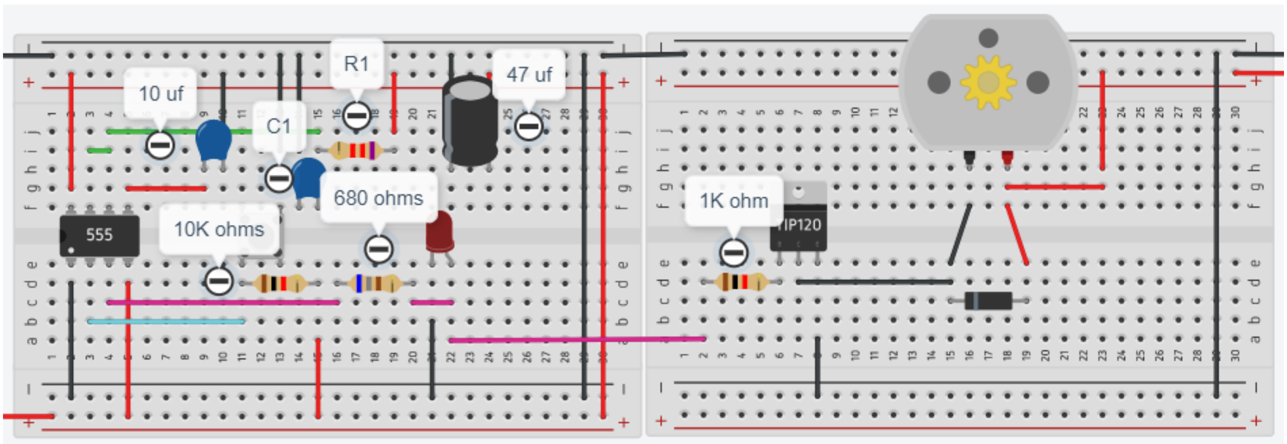
   R: We took the first and second value of the resistor an when we play the simulation the led turn on for 3 and 5 seconds respectivly and then turn off, whe observe by doing this that when we put a higher value in the resistor, the led stays on for longer.

6. Assemble stage 2 and integrate the terminal of the output pulse to the input of the base of the transistor of this second stage.

- Simulated stage 2



- Simulated stage 1 and 2



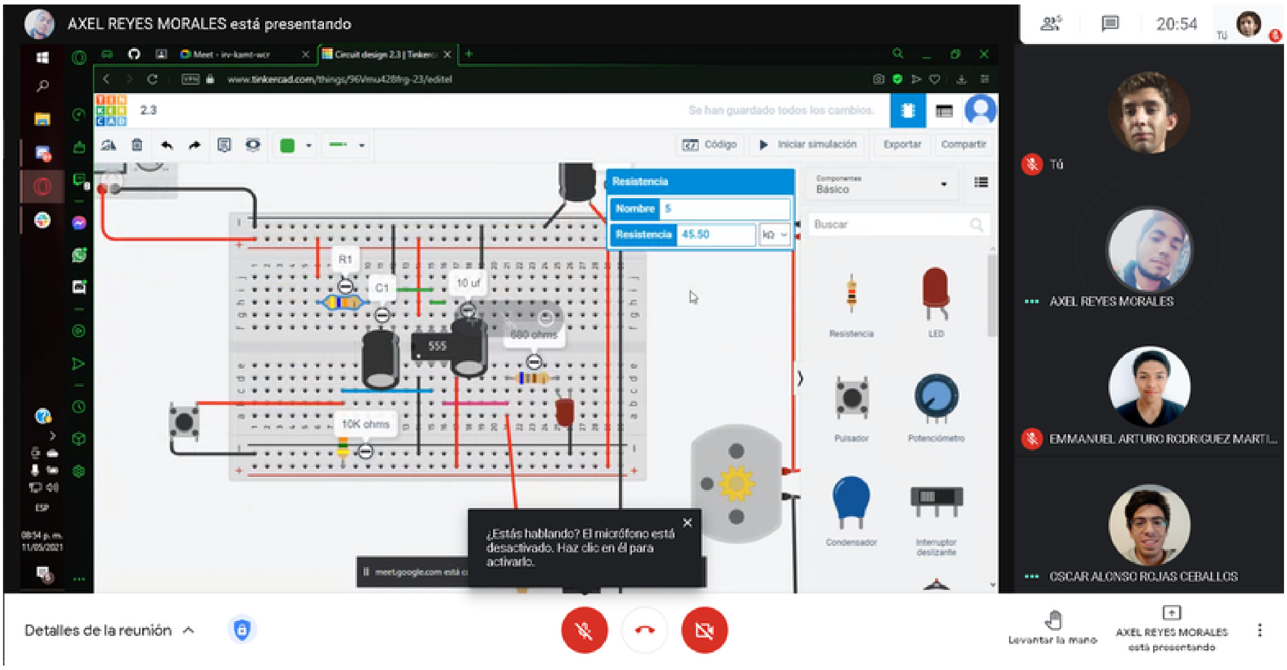
7. After completing the previous step, choose one of the 3 conditions recorded in the table above and observe the behavior of the DC motor.; **Explain you observation**.

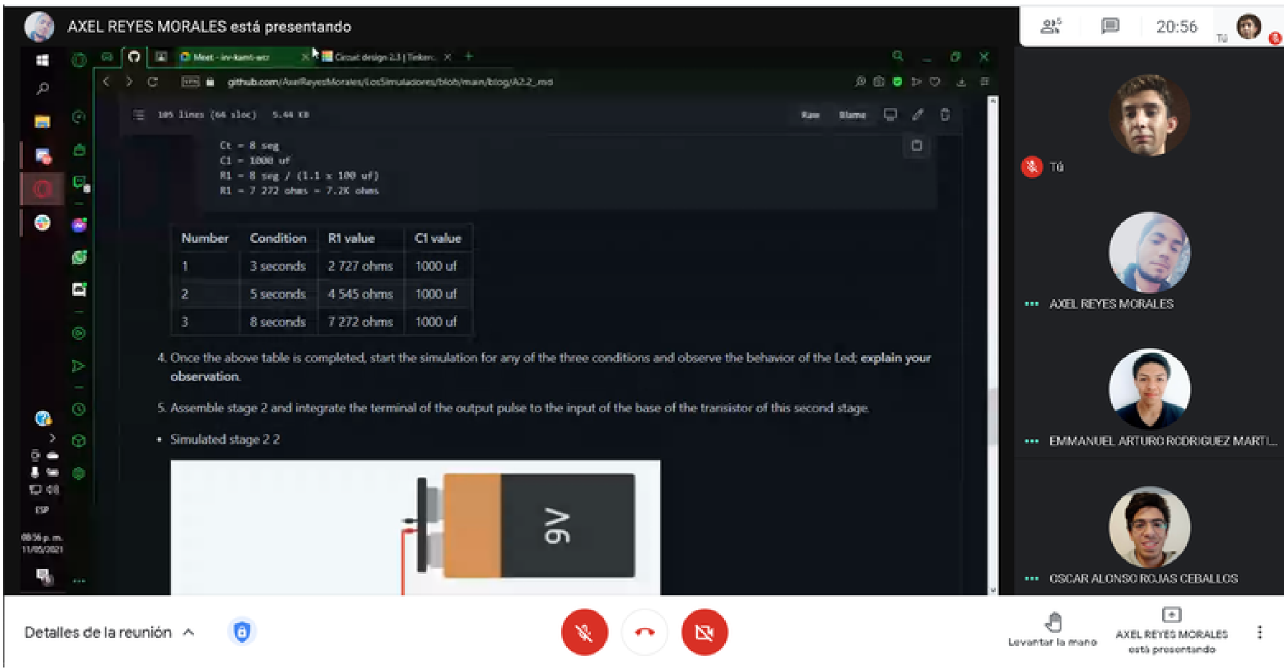
   R: After the output pulse activation time has expired, that is, the output connection remains in the low range and the trigger remains in the high range, the motor will stop as it does not receive the current flow.

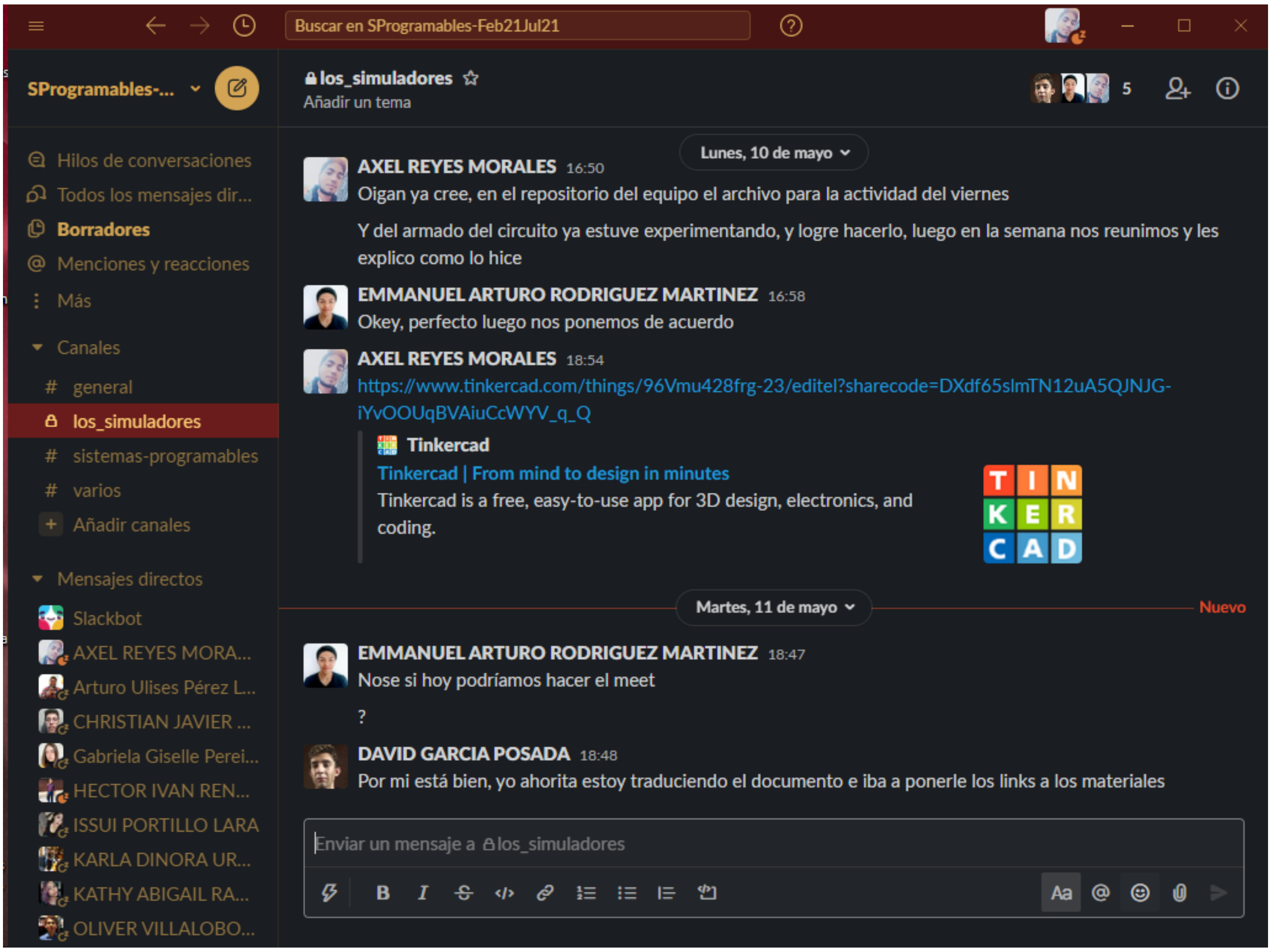
8. Once the stage 1 output pulse on time is complete, **What happened to the DC motor? Explain the reason for this behavior**

R: The DC motor stop, it happens because there no high pulse on the output from the stage 1 circuit and because of that the DC motor of the stops.

9. Insert images of evidence such as meetings of the team members held for the development of the activity.







10. Include the individual conclusions and results observed during the development of the activity.

    David: It was observed during the simulation that the timer circuit can not only control the time that a led lasts on but also control a motor and other electric actuators by modifying the operating time of these depending on the value of the resistance R1.

    Axel: In conclusion I can say that the integrated circuit NE555 allows us to control the type of duration of the width of a pulse, that is, that allows us to have a high load or voltage for time intervals that can be activated by a trigger within a mono-stable circuit.

    Emmanuel: In conclusion, the Integrated circuit NE555 works as a timer since if the trigger terminal reaches a current that keeps it in a low range, the output will rise, activating for a certain time depending on the capacity of the components.

    Oscar: The NE555 let us control the time of a pulse with the aplication of Pulse widht modulation, with this we can manage how many time the pulse will be in high state and how many in low state, another important part it's that we can trigger this behavior of the NE555 via pin 2 of the component just by grounding the it.

Repositories

Axel Go to my repository

David Go to my repository

Emmanuel Go to my repository

Oscar Rojas Got to my repository