

***KING ABDULAZIZ UNIVERSITY***

***FACULITY OF ENGINEERING***

***Subject: IE 201 (52405) (11)***

***Instructor: Eng. Khalid Aljohani***

***Assignment L3.E***

***Team# 4***

***2021\12\09***

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| --- | --- | --- |
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**Presentation of Technical work Checklist**

Evaluation of Team Four ‘s Work Product: L3.E

1. Work Evaluated by Team Four Assessment Symbol/Color Green Date 2021\12\09
2. Work Evaluated by Assessment Symbol/Color Date

The following Checklist can be used to assess any body of technical work to make sure the work is being presented according to the expectations of the IE 201 faculty. This Checklist is referred to in all the other Assessment Checklists that you will be using and, while you may not actually print and fill in this Checklist for all of your work, you will need to at least mentally complete this Checklist for **all** of your work

| **Yes** | **No** | **Expected Features** |
| --- | --- | --- |
|  |  | 1. There is material (i.e., a **Context**) at the start of the work which marks the **beginning** of the new work and **orients** the reader (i.e., gives the reader some sense of what follows)? This material should include:    1. tells the reader how this work fits into a bigger problem (e.g., Every successful project in life should follow certain quality rules and regulations.),    2. explain why the work will be/was done (e.g., This is a homework assignment on equilibrium or This work on frame weight will be undertaken to get a better idea about how much this Home Exercise Machine might weigh; I prepared this memo on our power shortages after last Friday’s power outage at Unit 67),    3. tells the reader what will be accomplished when the work is done (e.g., After this assignment is completed, I will have shown I know how to do force balances and will be prepared for the quiz or when this work is completed, we will know the frame weight), and    4. tells the reader the important topics to follow and the order the topics are addressed (e.g., This report first discusses the methodology used, then presents the test results, and ends with a discussion of the testing) |
|  |  | 1. There are dates and names of the people who did the work on at least the first page of the work |
|  |  | 1. The work looks professional (e.g., the material is readable, font is 12 pt., neat, plenty of white spaces, figures and plots are numbered and have descriptive titles.) |
|  |  | 1. Based on the Context, the work is what you expected to see |
|  |  | 1. The work is professional and ethical |
|  |  | 1. There is material (i.e., **Discussion**) at the end of the work, which marks the **end** of the work and **discusses** or **reflects** on the work done. This end material could discuss:    1. what was learned (e.g., The frame weight was 34 kilograms which is much lighter than any machine we have found in the stores or This cone surface area of 250 m2 is huge, about a third of a football field),    2. the process used in working the problem (e.g., I could not work this problem until I realized I could replace 1 with sin2Θ + cos2Θ or until we simplified the frame, we were not able to get our model to converge),    3. the correctness of the result (e.g., The answer to this problem is 14.6 m2, which matches the answer in the back of the book or This weight of 34 kilos, while it seems light, is probably correct; the model was checked using example problem 4.5 in Shigley), and    4. what will happen next (e.g., Now we can calculate the cost of our device) |

**Results of Assessment**

|  |  |  |  |
| --- | --- | --- | --- |
| **M** | **NI** | **NCE** | **Presentation of Technical Work**   1. **M**, meets expectations, requires **all** Yes’s for items 1 to 6 2. **NI**, needs improvement, is given if there are any No’s for items 1 to 6 3. **NCE**, no credible effort, is given if there is little to no work to be assessed (1 SR-Fault charged) |

Team Four's Work Products Being Evaluated: **Project 1 (Assignment #L3-E)**

1. Work Evaluated by Team Four Assessment Symbol/Color Green Date 2021\12\09
2. Work Evaluated by Assessment Symbol/Color Date
3. Work Evaluated by Assessment Symbol/Color Date
4. Work Evaluated by Assessment Symbol/Color Date

|  |  |  |  |
| --- | --- | --- | --- |
| **Yes** | **No** | **Self Regulation Issues** | |
|  |  | 1. The work meets the expectations for the Presentation of Technical Work | |
|  |  | 1. There are **no** *small* problems with the Table of Contents (TOC) | |
|  |  | 1. There were no other Self Regulation Problems (describe if no ) | |
|  | | Enter a **1** (one) in the cell to left if any of the items listed above are marked as **No** | |
| Comments on Self Regulation Issues | | | |
| **Yes** | **No** | | **Expected Features** |
|  |  | | 1. The work meets expectations for the Presentation of Technical Work. |
|  |  | | 1. The TOC has been updated to reflect the new work. (Page numbers are shown for all tasks and sub tasks; page numbers are right justified; only the page number for first page of work is shown.) |
|  |  | | 1. There is a completed correct KTPPA Table. |
|  |  | | 1. There is a completed Bill of Materials (BOM). |
|  |  | | 1. There is an assembly plan. |
|  |  | | 1. There is explicit evidence that material from the KTPPA table was used in the final assembly plan. |
|  |  | | 1. **Find five positive and five negative Impacts on environment (with mitigation measures)”EIS STATEMENT”** |
|  |  | | 1. **Find five positive and five negative Social and cultural Impacts (with mitigation measures)** |
|  |  | | 1. The level of communication "noise", which consists of grammatical, spelling, syntax, etc. errors, is acceptably low. |
| Comments on Expected Features and how any problems might be resolved | | | |

| **Wow** | **Ok** | **Weak** | **Revealed Features** |
| --- | --- | --- | --- |
|  |  |  | Rate the quality of the notebook organization (e.g., use of unique page numbers, reference to other work in the notebook, sense of continuous work on a single large project consisting of numerous tasks, etc.) |
|  |  |  | Rate the quality of the KTPPA Table (number of problems, good preventative actions – “realistic”, good contingency actions – not preventative) |
|  |  |  | Rate the quality of the Assembly Plan (completeness, interesting features, appropriate use of technology, earlier versions of plan with improvements) |
|  |  |  | Rate the quality of Discussion of the Assembly Plan Testing (L3e) |
|  |  |  | Rate the quality of discussion of Environmental Impact Statement and Social and cultural Impact |
|  |  |  | Rate the quality of Discussion for the entire project (L3) |
|  |  |  | Rate the quality of team meeting material (e.g., explicit roles, agendas, meeting minutes, team processing, etc. – there needs to be some amount of this material to get at least **Ok**) |

| **Yes** | **Exciting Features** |
| --- | --- |
|  | 1.We have written a detailed assembly plan.  2.We have done a detailed cost estimation for the project 3.We have done a stimulation for the project by EveryCircuit |

**Results of Initial Assessment[[1]](#footnote-1)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **E** | **M** | **NI** | **NCE**  **NS** | **SR-Lapse** | 1. **E**, **all** Yes’s for the Expected Features, **no** Weak’s for the Revealed Features, and **several** Wow’s and/or Exciting Features 2. **M**, **all** Yes’s for the Expected Features, **only a few** Weak’s for the Revealed Features 3. **NI**, **any** No’s for Expected Requirements or **mostly** Weak’s for the Revealed Features 4. **NCE**, there is little to no (**NS**) work to be assessed |

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**King Abdelaziz University IE201 Faculty of Engineering Date: 9/12/2021 Instructor: Khalid Aljohani Section: 11 Team Four**

**Assignment L3.E**

# Context

Recording notes about the product that was made and the scientific methods that lead to produce it is a base of preserving civilizations. To evaluate it, share it, and save the ideas from extinction. This work of our product is to evaluate the project we ended up with and to set the steps that we did to invent it in order to make our team members and the readers of this report more aware of how we did this project. At the end of this assignment, we expect to know what methods we did and learned scientifically or spontaneously to produce this project’s product and to evaluate our real work with an expected user. Starting with the bill of materials we gathered to implement the project, after that the assembly plan we did of the components orderly. Going through a list of things that evaluates the project in both social and environmental impacts, ending with an evaluation of a willing consumer of the final project and a discussion that concludes the results.

# The work and the Agenda

On Sunday 28/11/2021 The leader, Saad Alhassan has sent the task's distribution for the team as the following: Saad Alhassan is working on the willing workers, the work, and organizing the L3.E file. The second and the third member Sulaiman Alahmadi and Bader Alghamdi respectively, are working on the assembly plan also, the general context, and discussion. Talking about the fourth member Abdullah Babader whom the job is to write the bill of materials (BOM) table, the project impacts, and draw the project in the Every Circuit. Finally, the fifth member Osama Afifi is the one who is responsible for checking the assignment and making the presentation for it. There are two important points to consider firstly, the points of the assignments have been gathered and brainstormed by the whole team, the previous tasks are only related to the writing sides. Secondly, the number and the difficulty of the task have been distributed regarding the other tasks such as the poster, L2, Video, etc. In this assignment, we'll start with the bill of materials (BOM) in order to write both the final and initial assembly plan. Having done them, so we can do the wiling workers. Then, we will search about the project's impacts. Finally, we have drawn the project in the EveryCircuit.

# Bill Of Materials (BOM)

Context

Every mountain is made of small stones, and every successful product is made of small components which allow the product to work sufficiently. We have done this assignment, in order to inform the reader about the tiny details of the project. We expect to end this step, with sufficient information so everyone how wants to ensure about our work, can assemble the project with knowing the needed materials. To accomplish that, we will talk about some main points such as the name of parts, quantity of them, their function, and an estimated figure for them. The following table (1.1) shows the BOM table. Following that is the table (1.2) which shows the figure of the parts. The following blank shows the second detailed cost estimation for the project.

**Second detailed cost estimation for the project**

**Number @ Rate Cost**

**1. Personal**

Team four (5 members) 12 hour @ 20.00 SR/hour 240 SR

**2. Tools and equipment**

Nails Owned -

Drill 1 hour @ 4 SR/ hour 4 SR

Saw Owned -

Welding Free 0 SR

**Total cost of tools and equipment** 4 **SR**

**3. Raw materials**

1. IR sensor 3 item @ 20 SR/ item 60 SR

2. Car toy with a remote 1 item @ 20 SR/ item 20 SR

3. Transistors (NPN) 3 item @ 1 SR/ item 3 SR

4. Connecting wires (m/m, f/f m/f) 3 packages @ 11.5 SR/ package 34.5 SR

6. Long Wires 3 meters @ 1 SR/ meter 3 SR

7. Resistors 1 package @ 20 SR/ package 20 SR

8. Small breadboard 2 item @ 15 SR/ item 30 SR

9. Relay (5V) 5 item @ 15 SR / item 75 SR

10. Power Supply 1 item @ 20 SR / item 20 SR

11. Batteries 8 item @ 1 SR / item 8 SR

12. Battery holders 2 item @ 5 SR / item 10 SR

13. Used mobile Phone 1 item @ 70 SR/ item 70 SR

14. Wooden box 1 item @ 130 SR/ item 130SR

15. Spring 3 item @ 10 SR/ item 30 SR

16. Fishbowl 1 item @ 70 SR/ item 70 SR

17. Electrical locker 3 item @ 34.5 SR/ item 103.5 SR

**Total cost of Raw materials 687 SR**

**4. Additional cost**

Every Circuit 1 item @ 60SR/ lifetime use 60 SR

**5. Supplies**

|  |
| --- |
| **Total artifact cost 1006 SR** |

Amazon, car toy delivery 1 time @ 15 SR / time 15 SR

Table (1.1) The BOM table which shows the details parts

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| No. | Name | Quantity | Location in the project | Function of it | Materials |
| 1 | IR sensor | 3 | Two of them are next to each other and the third is in front of them in the middle | To catch the drowning body | a pyroelectric component (a combination of metal and crystal) and additional electrical elements, |
| 2 | Car toy with a remote | 1 | We will use remote as if it is the ring and it will be with the drowning person | Send a notice to the relay to open the electrical locker | The majority of die-cast toys are made from Zamak, |
| 3 | Transistors(NPN) | 2 | On the breadboard to pair car with the ring | It amplifies the current | Silicon |
| 4 | Connecting wires | 3 | To extend the wires | To increase the length of the wires | Various metals and alloys |
| 5 | Resistors | 4 | It will be on the second breadboard which includes the remote and car toy | It will decrees the voltage | a mixture of finely powdered carbon and insulating material, usually ceramic |
| 6 | Small breadboard | 3 | The breadboard is the piece that all pieces reach | To connect all the circuit together | white plastic and is a pluggable (solderless) |
| 7 | Relay | 5 | In the corners of the box | To open and close the electrical locker | Relay contacts, electromagnet, movable armature, yoke and coil power supply |
| 8 | Power supply 12V | 1 | On the wall | To deliver power to the circuit | The body is made of plastic materials, electrical conductors are made of an alloy of copper and conductive metals. |
| 9 | Batteries | 8 | On the box to deliver electricity to breadboard | To deliver power to the breadboard | Manganese dioxide. Steel, Zinc, Brass. |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 10 | Spring | 3 | Behind the locker to push the buoy | To launch the buoy that will save the body | M5 | a variety of elastic materials |
| 11 | Electrical lockers | 3 | In front of the springs to catch the springs | When the locker is open the spring will launch the buoy | M4 | Spring, iron head, two wires positive and negative and copper coil |
| 12 | Fishbowl | 1 | In the middle and it will be like small pool | Applying the project on it | M3 | Made of glass |
| 13 | Mobile phone | 1 | It will be outside the bowl and it will receive calls | Receives calls from the remote | M1 | Processors, iron motherboard includes numbers and control buttons |

Table (1.2) The figures of BOM parts

|  |  |  |
| --- | --- | --- |
| 1. IR sensor | M4 |  |
| Car toy with a remote | M3 |  |
| Transistors (NPN) | M2 | صورة تحتوي على نص  تم إنشاء الوصف تلقائياً |
| Connecting wires | M5 |  |
| Resistors | M1 |  |
| Small breadboard | M4 |  |
| Relay | M2 |  |
| Power supply 12V | M2 | صورة تحتوي على لعبة  تم إنشاء الوصف تلقائياً |
| Batteries | M3 | C:\Users\amsb2\AppData\Local\Microsoft\Windows\INetCache\Content.Word\Screenshot_18.png |
| Spring | M5 |  |
| Electrical lockers | M4 |  |
| Fishbowl | M4 |  |
| Mobile phone | M1 |  |

Discussion

In this step, we learned many important points and we gained good knowledge about the electric component; we did brainstorming to know the needed items and then we search on websites for shops that sell the items that we need. We met with eng. Mohammed Ashour to make sure that we have all the right parts. Now we can move to the next step which is assembling the parts.

# Initial and final Assembly plan

Introduction

Not knowing how to assemble components will be a dead-end for anyone who wants to work on our project. So, in this topic, we'll discuss our initial and final assembly plan steps to inform people about the components and the electrical circuits that we have on our project. Another reason is to use it as a reference for us that could help us if we forgot something or just want to make sure everything works perfectly. Now we will show you the primitive assembly plan we did as a start to figure out how do components work and can relate to each other. And we'll show you the final assembly plan that we finally managed to reach this right moment. The important topics that'll be revealed next are the initial assembly plan, the final assembly plan, and the components we used on our project will be as follow: 5 Relays, 3 IR Sensors, 3 Electric lockers, a set of Male/Female wires, a set of Male/Male wires, 4 Breadboards, a set of resistors, two-car toys, battery base and a set of batteries, Power supply 12V, Fishbowl.

The Body

At first, the IR sensor figure (1) didn't work. We figured out that the reason was that the positive and negative wires from the battery were not connected directly to the IR sensor as it supposed to be. So, we connected the positive wire with the VCC input and the negative wire with the GND input. After we figured out how the IR Sensor works, we moved to the next part, Relay. The relay is like a switch, and we want to connect the IR Sensor with the relay so we can move to the next step.

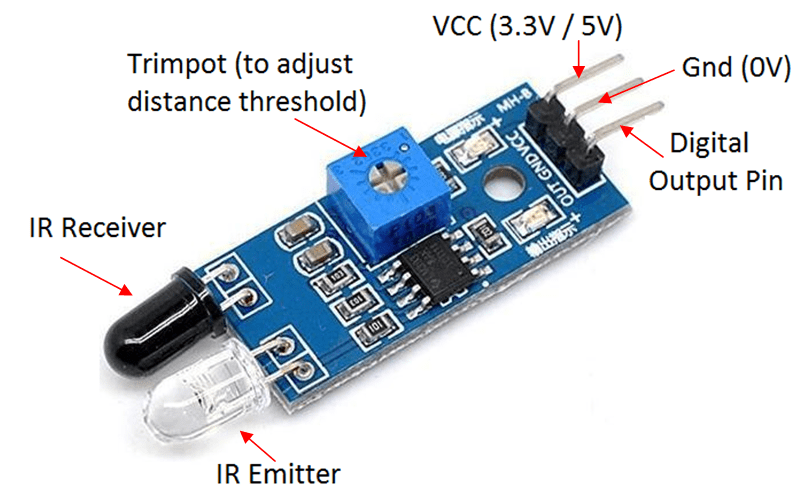


Figure (1): A realistic picture of the IR Sensor

At first, we connected four Male/Female wires to the relay shown at figure (2) from the front that has four inputs, and they are as follows starting from the right: VCC, INP1, INP2, GND. Then we connected the wire from VCC to the positive side of the breadboard and the wires from INP1, INP2, and GND were connected on the negative side of the breadboard. By doing that we managed to let all the three lights on the relay light up, which means it's working! But the problem now is that we can't activate the IR Sensor and the Relay at the same time because of the difference in connection method. To solve this problem, we connected the positive and negative wires from the battery base to the positive and negative sides of the breadboard. Then we activated the Relay the same way we did before. Finally, for or the IR Sensor, here comes the difference. Instead of connecting the battery base directly to the IR Sensor, we placed the IR Sensor at the middle of the Breadboard and grabbed two Male/Male wires to connect them. One wire was connected between the positive side on the Breadboard and the VCC on the IR Sensor. The other wire was connected between the negative side of the Breadboard and the GND on the IR Sensor. Last but now least we grabbed the INP 1 wire from the negative side on the Breadboard and connected it to the digital output on the IR Sensor. The result was that the IR Sensor sends a signal to the Relay whenever something enters the area it surrounds. Now after knowing how the IR Sensor and relay works, it's time for us to activate the electric lockers by connecting them to the electric circuit. To do that we must connect the wires from the electric lockers to the backside of the Relay that contains 3 inputs starting from the right, normally open, common, and normally closed. We faced a problem figuring out which when one is normally open and normally closed. So, we started searching how to say the difference between inputs. After we kept searching for like half an hour, we managed to tell the difference between the inputs. The electric lockers contain two wires so, by connecting one wire from the electric locker to the normally open and the other wire connected to the common we finished our first electrical circuit. By repeating the same steps, we did before, we managed to activate the three lockers. For the final step, we attached a male/male wire from the normally open of the third Relay to the common of the fourth Relay to its energy. Then we attached three wires to the common of each Relay. The three Relays that supports the electrical lockers were attached to the negative input of the power supply and the wire from the common input of the fourth Relay was attached to the positive input on the power supply. After doing all these steps, the whole project was active. Now we must make the project capable of catching an outside signal when the IR sensors are active so we can control the electric locker instead of instantly activating whenever the IR sensor is active. To do that we need the electrical circuit from the car toy and its remote controller, resistors, and transistors. These parts will be discussed in the final assembly plan.

A close-up of a computer chip

Description automatically generated with medium confidence

Figure (2): Relay

After reviewing our primitive project activation, we did a KTPPA that contains the problems we faced and the preventive actions we've made to avoid them. Not forgetting the possible causes and the contingency plans we've put. As shown in table (2.1)

Table (2.1) The KTPPA for the initial plan

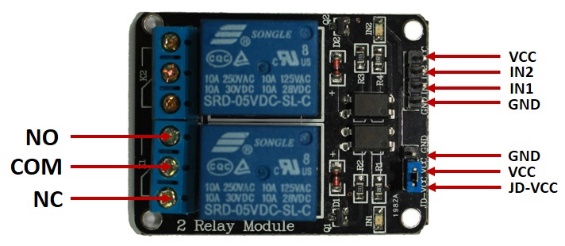
|  |  |  |  |
| --- | --- | --- | --- |
| Problem | Possible Cause | Preventive Action | Contingency Plans |
| 1-Component is not working | . False electrical circuit  . The component is broken | . Power up the peace independently to make sure it's working | . Buy a new component |
| 2-Can't connect an IR sensor and a relay at the same time | . False electrical circuit  . Broken parts | . Know the difference between how the parts must be connected to the electrical circuit  . Try multiple ways of transporting energy | . Check on the parts to make sure that they are not broken.  . Ask for help from the facilitator |
| 3-Lockers activates whenever a signal is received | . the electrical circuit is always activated | . Attach a component that can control the circuit | . Make a new circuit that fits the idea |
| 4- Transistor could burn | . Unbearable voltage goes to the transistor | . Put a resistor | . implement a simulation circuit to avoid mistakes |
| 5-Not knowing which input is normally closed and normally open on the Relay | . Lack of knowledge | . Search on internet about Relays to know the difference | . Ask a professional electrical |
| 6-Having an extra useless button | . Car remote controller comes with two buttons | . Add an extra feature to the project that the extra button can control it | . Erase the extra useless button if there are no ideas |
| 7-Elictric locker not being activated | . False electrical circuit  . High pressure or weight from the spring is on the electric locker | . Make sure the electric circuit is correct  . Reduce pressure or weight on the electric locker | . Buy a better electric locker  . Buy a smaller spring |

**Step one: Giving power to the important parts**

At this first step, we made sure that the important parts are working so we connected it with the power taking the VCC from the relay and the IR sensor to the positive side from the battery and the GND to the negative side. The power we used was a result of a 6-volt battery pack figure (3) to power up the whole circuit.

صورة تحتوي على إلكترونيات

تم إنشاء الوصف تلقائياً

صورة تحتوي على نص, إلكترونيات, دائرة إلكترونية

تم إنشاء الوصف تلقائياً

Figure (3): The components we used in step one

**Step two: connecting the IR sensor with the Relay**

At this step, we took the communication part to another level by connecting one IR sensor with one Relay by putting a Female/Female wire on from the input of the Relay to the output of the IR sensor. Now whenever the sensor takes a signal the Relay receives and gives an incredibly beautiful sound that makes you know that you’re doing well with the progress. Also, after many attempts, we learned that by using the male/male wires that could transfer the energy from batteries to other components which will activate them all at the same time.

**Step three: adding the electric locker to the circuit**

By ending this step, huge progress has been made. It’s all about the main part that will help us to make a physical change by the signal it would be received from the sensor, the Electric locker. This component has two wires out of it one positive and the other is negative. The order isn’t important however about where’s the positive and the negative wire. At the back of the relay, there are 3 entries called respectively Normally open, Common, and Normally close. The positive wire of the lock will be going to the Normally open of the Relay as the negative side will be going to the negative side for a power supply that has 12 Volts. After that, to give power to the locker we connected the positive side of the power supply to the Common entry on the back of the relay. Now we can say that the IR sensor is connected to the locker and by every signal, it takes the lock will be open, and whenever the signal ends the lock will be closed. Figure (4).



Figure (4): Components being attached

**Step four: repeat the first 3 steps**

We used 3 lockers, 3 IR sensors in our project to make sure most of the areas are covered so the first 3 steps will be repeated with 3 relays. Figure (5)



Figure (5): The essential electrical parts of our project

Each relay is responsible for connecting a lock with one IR sensor and to make sure everything is working right every negative side of each lock will be connected to the negative side of the power supply. Figure (6)



Figure (6): The parts that'll be connected to negative side of the power supply

by taking care that the power supply is one and there will be 3 wires going on the positive side of the power supply, each wire is coming from the common entry of the three relays. Figure (7).



Figure (7): The parts that'll be connected to positive side of the power supply

So now we ended with their wires for each relay going from the positive side of the power supply to the common entry in the relay. Above more three wires for each lock go from the negative side of the power supply to the negative side of the lock. After we’ve done this, we made sure that every lock is working while reserving a signal from the sensor it’s connected to through the relay and now, we can work on the 5th step that will help us turn on and off the circuit with pressing a button from a transmitter.

**Step five: adapt the lockers with the FM receiver**

At this step, we disconnected the negative side of the lockers from the power supply. we used an FM transmitter and receiver form a remote-control Car to turn on or off the circuit that will make the electric locker work. The fourth relay is the one that will connect the remote to the lockers. Figure (8)



Figure (8): The components that'll be connected to the 4th Relay

After this, the three negative sides from each lock will be connected to the NO of the fourth relay as from it the common side of the relay will be connected to the negative side of the power supply, and by that, we’ve succeeded in making the 4th relay responsible of giving the lockers the green light whenever it receives a signal from the transmitter. Now we’ve collected the circuit from the car toy to link it with the input on the fourth relay. So, whenever the 4th relay receives a signal from the remote control, the lock that’s been taking a signal from the IR Sensor works immediately and opens.

**Step six: Making sure that the voltage calculations are correct**

We used a multimeter to know how much voltage is coming from the circuit while it receives a signal from the remote and it turns out that it’s 3.5 voltage, knowing that the transistor can't handle more than 0.7 voltage. we used a transistor (NPN) to connect the relay by giving the transistor at first a power from the batteries with taking care of placing a (560) ohm resistor so the transistor cannot be damaged by the high voltage and then connecting the collector of the transistor to the input of the 4th relay and the base to the FM receiver circuit with a resistor of (4.7k) ohm to make sure the transistor won’t be damaged by the voltage from the receiver. Figure (9)



Figure (9): Attach the circuits using a transistor

**Step seven: Adding the emergency calling feature to the project**

Now we ended up with a final additional button from the transmitter. We made this additional button work for an additional feature that our project can give. We combined it with a mobile phone to make our project is capable of an emergency calling while holding the second button. So, to do this, we got an old mobile phone and programmed button 5 of this mobile phone to do a fast call by any number we choose if anyone holds the number for a few seconds. After that, to attach the button on the phone with the second button on the transmitter. We welded two copper wires from button number 5 on the phone and connected it with an additional Relay, then we did the same connection we did with the receiver circuit with the wire that should receive the signal from the second button of the transmitter. Figure (10)



Figure (10): The additional parts that has been added for the extra feature

**Step eight: set up the components and the circuits on the prototype**

Now we have done the whole electrical part successfully thank God. we just must place it into a real prototype. The mechanical method we used to send the float bodies to the user is by springs. So, whenever the lock opens the spring shots the Float body to the place it should go. As well as 3 areas will be the transmission points. We made A wooden frame to place up the components and the circuits on it and in the center of it, we made space to put the minimized pool on it. We tried multiple types of glue to set the locks on the prototype, but it didn’t work at first and we ended up with glue that can stick the iron side of the lock with the wood frame. By extending the wires, we managed to set every component in its place. We found out that the lock is receiving a signal, but it is not working due to the pressure coming from the spring. So, we tried to reduce the pressure with everything we can do but it didn't work. We used the contingency plan we put in and bought a new lighter spring that can fit with the locker. The figure (11) shows the real picture of the project.

A picture containing floor, indoor, oven, stove

Description automatically generated

Figure (11) A real picture of the final assembled project.

Discussion

After finishing our initial and final assembly plan, we've learned how to do electric circuits. Also, we've learned the way of combining the components together and activating them the same time. The process used to do a perfect electric circuit is by starting to simulate an electric circuit on "Every circuit". The components were bought from several electronic stores. The phone was purchased to implement an extra feature to raise expectations of our project, we brought it from a small mobile store. We made a lot of mistakes in the initial assembly plan. Our KTPPA has seven problems that were discussed in table 2.1. One of the biggest mistakes we've faced was that the Electric locker won't work when the Spring is attached to it. We first thought that there's a mistake on the electric locker's circuit, then we realized that the actual problem was that the Spring has a high burden on the electric locker. So, we've cut the Spring to make it less heavy so the electric locker could work with it. After we've fully completed the assembly plan, we are ready to focus on luxuries and the remaining business associated with the project.

# Project stimulation using EveryCircuit

Introduction

Have you ever asked yourself why every successful project in this life has an alternative and backlines plan? The answer that no one will doubt, is to make sure that the work won't stop if a problem stands up due to the variety of alternatives that could be taken. In the L3.e assignment, we were assigned to do a stimulation for the project using Everycircuit in order to make sure that the project is working and avoid mistakes in reality and that's why we've done this assignment. By the end of this step, we'll have the stimulation of our project and we will be ready to assemble it in the reality. To accomplish that, we will use the Everycircuit program to do the stimulation.

The Body

There is a one disadvantage of using EveryCircuit program when stimulating a real project. which is that the complicated items such as the electric locker, IR sensor, and Remote parts are not exist in the program. As a result, we have brainstormed in a long period in order to come up. The idea is to compensate these things we represent the IR sensor and remote as a Push Button NO. Talking about the Electric Locker which has been represented as Light-Emitting Diode as shown in figure (12 ). Notice that we have abbreviated it to one cycle instead of three to make it easier for the reader because the other two circuits are the same of the circuit but conduct with the no remote except the remote of the first circuit.

A picture containing graphical user interface

Description automatically generated

Figure (12) Our project's stimulation using EveryCircuit program

When the swimmer uses the remote, the electricity runs in the three circuits. Two of them will cut the electricity. The only one that will receive electricity and make it continue to activate the relay and turn on the electric locker is the circuit that has a reading from its IR sensor as shown in Figure (13).

Graphical user interface

Description automatically generated

Figure (13) The circuit when the remote activated and the IR sensor reads

Discussion

We have learned an essential thing from this step, which is the importance of stimulation of products before assembling them. After using Everycircuit, we found the true values of batteries that we should use. If we didn't do this step we might damage our components. To do the stimulation, we registered on the program's website and made an account on it. Then, we searched on YouTube for the use of some parts, and then, we assemble it on the program. To make sure about the correctness of the stimulation, we conduct the instructor of the workshop and discussed with him. Now, we are ready to do the next step which is assembling the project in the reality.

# Wiling workers

Introduction

The world we are living in is changeable on many of its sides, which requires humanity to know how to assess their tasks from time to time. One of the common ways to do that is the willing workers. We have applied this method in order to improve our project and to make it better. By the end of this method, we will know our project's points of both strengths and weaknesses so that we can develop them. To reach these goals, we will take about major points such as

The Body

Yasser Alzahrani master’s in law from the University of Strathclyde in Glasgow, about the project Yasser said. The project is fabulous due to the benefits it can give to the safety environment in swimming, and he thinks that this kind of project is good if it applied on as many environments as possible. Applying the project will help decrease the number of victims of drownings. That also will decrease the reliability of lifeguards making the project benefits commercial companies that might reduce the costs of hiring lifeguards at a large amount of time. This gives a result of reducing the job market in some majors of swimming safety. It also gives a result of producing multiple new jobs with maintaining and operating this self-rescuing technique. Some notes about improving the project Yasser has is that the bracelet can be programmed for giving a call to multiple devices at the same time or it can be adapted with an alarm that will be more effective of delivering the emergency message. An exceed idea is that if we can add a Location Tracking feature that specifies the exact location of the drowned one to make sure that they would be save themselves by themselves.

Discussion

We have learned from this step so many important things, such as the importance of the willing workers in evaluating the project. Yasser AL Qahtani have given us so many important notes. These notes will help us to develop the project next time. The process we used to do this step, is to use Video calls with Yasser. Also, we explained to him the project and then, he discussed it with us. He gave us his opinions and the how can we enhance our project. We are sure about the correctness of this result because two members explained the project to Yasser, and they clarified it to him successfully. Now, we can move to the next step which is evaluating the project's impacts.

# Environmental Impact

Introduction

Every project has advantages and disadvantages that can affect the environment and might affect health in general. We are doing this step in order to recognize the positive and negative impacts for our project and we will find mitigations for the negative impacts. When we finish this step we will make the person who will read the step know how the project will affect the environment, to reach this aim we will talk about the positive and negative impacts to our project. The following blank shows the positive impacts and the table (5.1) shows the negative impacts and their mitigations.

Positive

1- The project does not produce harmful gases.

2- The project has low percentage of ignition.

3- Most of the parts of the project can be recycled

4- The project has low chemical components that might be harmful

5- Saves lifes

Table (5.1) the negative impacts and its mitigation

|  |  |  |
| --- | --- | --- |
| No. | Negative impact | mitigation |
| 1 | It might take a space of the pool | Use small components |
| 2 | Some parts of the project are quick to rust and corrode | Use of insulators and protection systems |
| 3 | The spring might fly and hit someone | Reducing the outer hole of the spring |
| 4 | There might be a radiation side affect | Use components that has less radiation |
| 5 | The project consumes a large amount of energy | Use solar power instead of electricity |

Discussion

In this step we learned we a good knowledge on how our project and how it will affect the environment in both negatively and positively. Also, we learned how can we mitigate the negative impacts. In this step we used brainstorming method to know which side that the project affects then, we wrote them in a paper in order to make sure about its completeness and its correctness. Now, we will go to the next step, which is evaluating the social and cultural impacts.

# Social and Cultural Impact.

Introduction

Everything in this life has benefit and disbenefit impacts which require us to search about them. In IE201 we were assigned to search about our project's positive and negative social impact, we are doing this introduction to show the reader how will the project affect society and how should we solve the negative impacts, the reader will have good knowledge of the impact of the project on society after completing this step. To accomplish that, we will mention five positive impact and five negative impacts with five mitigations to the negative impact. The table (6.1) shows the negative impacts and its mitigation, and the following plank shows the positive impacts.

Positive

1- When a person sees the project, he will feel that swimming is safer.

2- Reducing drownings cases.

3- rescue more than one person at the same time.

4- it helps making lifeguard's mission easier.

5- The project does not emit smoke that is harmful to the person.

Table (6.1) the negative impacts and its mitigation

|  |  |  |
| --- | --- | --- |
| No. | Negative impact | mitigation |
| 1 | When the people depend so much on the project then it might reduce awareness of the dangers of swimming. | Put a poster on the project to remind the danger of depending so much on the project. |
| 2 | People distrust the project for the fear of mechanical failure which lead to fear of swimming. | Prove that the project made of high-quality material. |
| 3 | The project depends on electricity which leads to decrees the percentage of swimming safety. | Use of solar powered batteries and use backup battery. |
| 4 | Decrease the effectiveness of the swimming lifeguards. | Remind them that even if the project exists there still a probability of drowning. |
| 5 | it is hard to appley in big pools that will make the small pools much crowded. | Make the project larger to fit the big pools. |

Discussion

After finishing this step, we learned how the project will affect society and how will we mitigate the negative impact of the project, we couldn't know these impacts until we finish the project, and we hope that our mitigations will make the best change to avoid the negative impacts from the project, now we can apply the project with knowing the negative and positive impacts of it and how can we mitigate the negative impacts.

# Discussion

We've learned that finishing the work doesn’t get you to the end. In order to reach it, there should be an evaluation of the whole picture and a final report that saves the effort that has been done. To keep the scientific progress, exist in multiple methods. We collected this knowledge by recording the steps that we took and guided us towards finishing this work of product we made. With evaluating it by different methods. In the end, we are more aware of the strength and weaknesses of this project as a team. We are proud of the amount of work we produced the work we were committed finishing in amount of time. and the creativity we did it with. We did our best to complete this and we are satisfied with any result it gives because the result of our product has already come by our minds, into our hearts. We will try our best individually or as a team after then to complete the road we went through and to keep inviting products with also improving the products we invented to be always the pioneers of the next generation.

# References

1. King Abdulaziz University. IE201 Website. Lab session < <https://sites.google.com/site/kauie201/concept> >  
    [Accessed 9 December 2021].
2. IR-sensor <https://solarduino.com/infrared-ir-sensor-module-with-arduino/>

Figure (1,3,4,5) [Accessed 9 December 2021].

1. Relay-module <https://robu.in/product/5v-2-channel-relay-module/> Figure (2,5,8,9) [Accessed 9 December 2021].
2. Relay-module [relay-module-pinout.jpg (712×310) (wp.com)](https://i2.wp.com/randomnerdtutorials.com/wp-content/uploads/2016/12/relay-module-pinout.jpg?resize=712%2C310&quality=100&strip=all&ssl=1) Figure (3,4,7) [Accessed 9 December 2021].
3. Battery Holder [Battery Holder for 4 x 1.5V AAA | GeeksValley](https://geeksvalley.com/en/product/battery-holder-cell/) Figure (3) [Accessed 9 December 2021].
4. Power supply [51xva8dWeZS.\_AC\_SL1000\_.jpg (954×964) (media-amazon.com)](https://m.media-amazon.com/images/I/51xva8dWeZS._AC_SL1000_.jpg) Figure (4,6,7) [Accessed 9 December 2021].
5. Transmitter & Receiver board -[27MHZ 2CH Transmitter + Receiver board + Antenna Wireless Circuit Remote Control Module for DIY Toy Car | Diy toys car, Radio control diy, Transmitter (pinterest.com)](https://www.pinterest.com/pin/600456562790155846/) Figure (8,9) [Accessed 9 December 2021].
6. Transistor [pnp-npn-transistor.png (1747×1240) (shoptransmitter.com)](https://shoptransmitter.com/product_images/uploaded_images/pnp-npn-transistor.png) Figure (9) [Accessed 9 December 2021].
7. Resistor <https://www.circuitspecialists.com/ra560.html> Figure (9) [Accessed 9 December 2021].
8. Phone <https://www.goodgearguide.com.au/review/nokia/1209/300615/> Figure (10) [Accessed 9 December 2021].

1. The results of subsequent assessments are on resubmission of work checklists found preceding this checklist [↑](#footnote-ref-1)