

IC-201P
Design Practicum
Electronic Junk Dealer
Report 2

Team Number: 6

Team Members

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Introduction

Human beings with the passage of time have increased their needs so there are variety of materials which they are using. So, more materials mean more waste and junk. Junk includes materials like newspapers, plastic bottles, iron, glass bottles, plastic wrappers etc. In short, Junk is basically a material which we cannot use directly but can be used again by recycling. Junk is a part of daily household. We have to wait for Junk dealer(Kabadiwala) to come to us and take the junk and in return pay us. In this process, we have to wait for junk dealer and till then lot of waste gets accumulated and we are not even paid the right amount for junk and junk dealer can also use malpractices to get more profit. As we are moving towards automation so why not make a machine which can do the work of junk dealer. In this way, the right amount for the junk will be paid and

as people are being paid they will try to give maximum junk as possible without littering it. Suppose even if a plastic bottle is lying on the ground and there is a machine which can take the bottle as input and pay us then waste like these can be easily removed and recycled. By throwing such recyclable material on the streets or into a common dustbin, the quality of recyclable material deteriorates as it gets soiled by wet waste, which often contains contaminated and hazardous waste.

Electronic Junk Dealer deals with mainly this issue. Electronic Junk Dealer is a machine which can do the work of junk dealer. It will take junk as input, crush it, store it in its respective bin and then pay user the appropriate amount of money. As we have to make a prototype so we are considering most produced junk like plastic and aluminium cans, etc. The machine will be fully automated and its basic model can be considered same as that of an ATM machine. The machine will first take input then sense the input. The sensing of input is done by various sensors like capacitive proximity sensor, inductive proximity sensor and IR sensor. There is cascading of different filters and hence we can sense input with greater accuracy. If the input comes out to be plastic or aluminium can, it will be weighed and appropriate money will be transferred to the user using e-commerce technology. The junk will be crushed and thrown in one of the three bins one for plastic, one for aluminium and rest for dumping any other waste like plastic wrappers but there will be no payment through the third bin. When the bin will be full, Message will be displayed on the screen and send to the Municipal Corporation so that they can empty it.

At least 15% of the total waste can conveniently be segregated at source for recycling, which is being thrown on the streets but by the method discussed above, waste can also be reduced and more materials will get recycled.

Problem Definition

Our product will take the junk/garbage as input from the user and pay them appropriately according to its weight and type, storing the junk in different compartments sorted according the type of junk.

Literature Review

The concept of automating daily life systems is one of the pioneering areas of research and sciences. Many ideas are being proposed daily to automate routine tasks. In India, we have a major problem of rubbish being littered here and there in most of the cities and countryside. This does not look good.

To combat such a problem, many new ideas are being proposed. One among them can be the deployment of such a system that can pay for what we throw. If such a system could be there, then most of the people will be compelled not to throw garbage here and there.

Upto now, several such automated separator have been built. One such product that we had in consideration was Automated Waste Segregator built by a team of students of Rashtreeya Vidyalaya College of Engineering (Cited in reference). But our team's project is such that it will only separate aluminium, plastics and landfill as it is only a prototype of the conceived idea. The good part is that unlike conventional automated machines, it will also give some compensation for the garbage user throws in it.

Solution Methodology

Electronic junk dealer is used to differentiate the input object and store them in different storage bin which will be helpful for recycling. The user is provided with some amount of money according to the material and weight. The Electronic junk dealer will separate the object to three different box one each for aluminium, plastic and landfill.

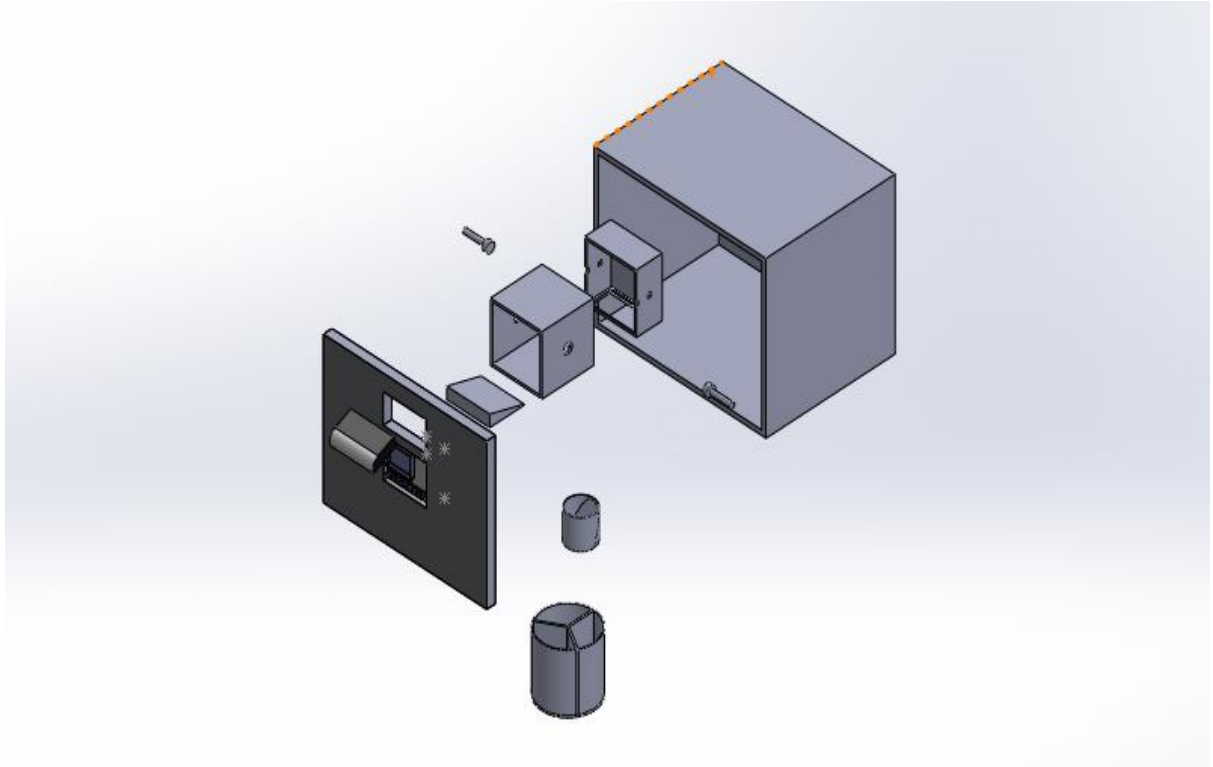
For differentiating objects different methods are used. To detect whether it is metallic or not magnetic proximity sensors are used. It works by producing a magnetic field, when there is a metal then it will induce a magnetic field which can be detected by the sensor. When it is confirmed that it is metal then we have to verify that it is aluminium. Apart from many other metals aluminium is a non-ferrous metal which is commonly used. By the measuring the eddy current produced by aluminium using inductive proximity sensor it can be identified.

If the object is not metal then to identify whether it is plastic or not we use IR proximity sensors. IR proximity sensors produce IR rays which will be directed to the plastic. The reflected rays are measured to identify different types of plastics. These methods can identify these two materials. The material other than plastic aluminium will be dropped into landfill. Capacity proximity sensor also used to identify the material. If it is also showing the same result then it will be confirmed and decided to drop into the desired storage bin.

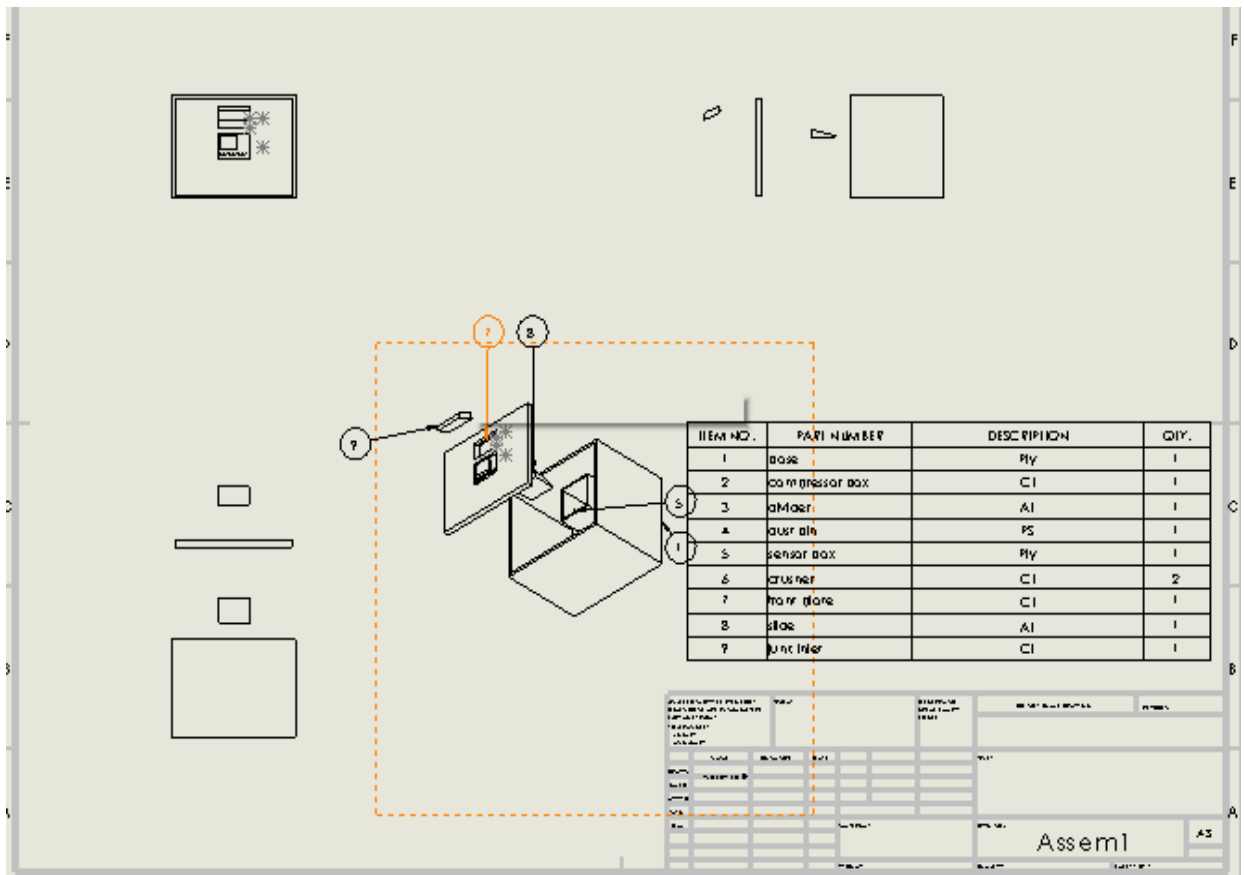
Because of providing money for the object the users are more interested to use it. When people want to get rid of their old and useless things this is the exact spot. When Electronic junk dealer will be placed everywhere near bakery, bus stand and other public places waste can be managed. Poor people also use it as an advantage by collecting junk from everywhere and putting it in Electronic junk dealer so that they can earn money. The Electronic junk dealer always gives the precise and updated amount. People will trust it than junk shop owners. In a small step forward with this machine will impact the society a huge amount.

Product Design

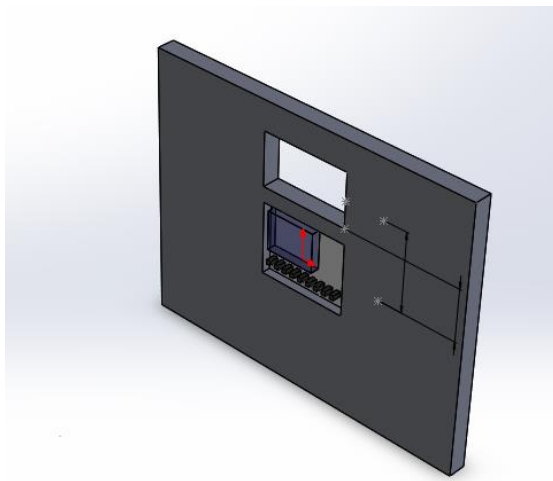
1. Mechanical Design



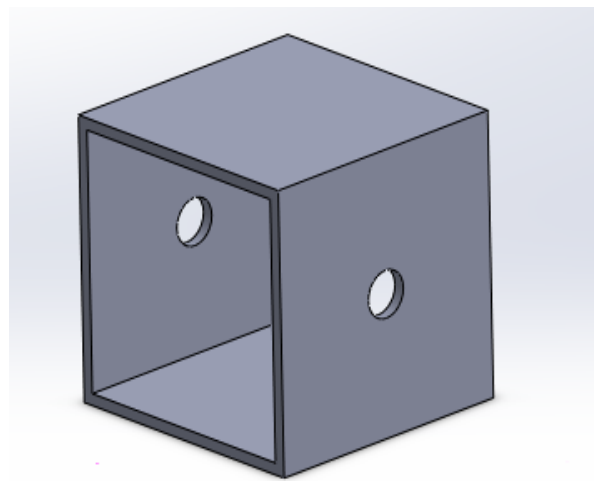
Complete Exploded View



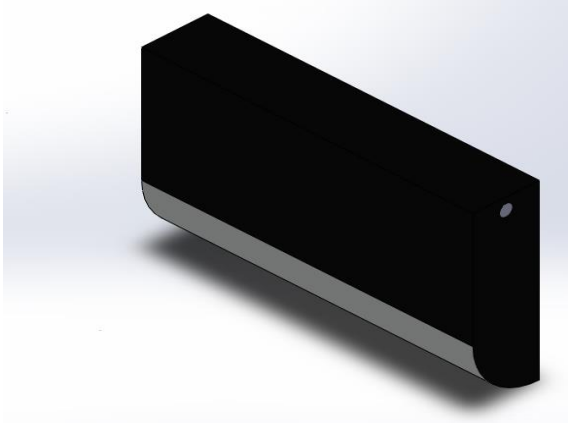
Complete Exploded View with details



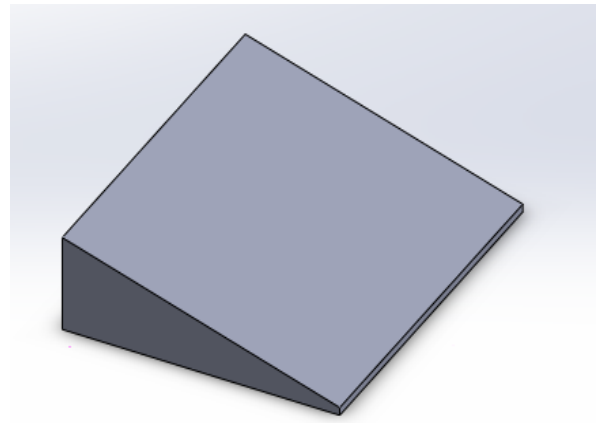
Front Plate



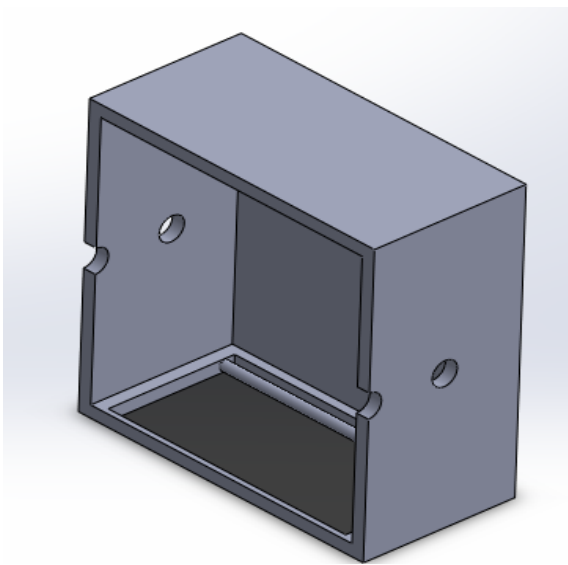
Sensor Box



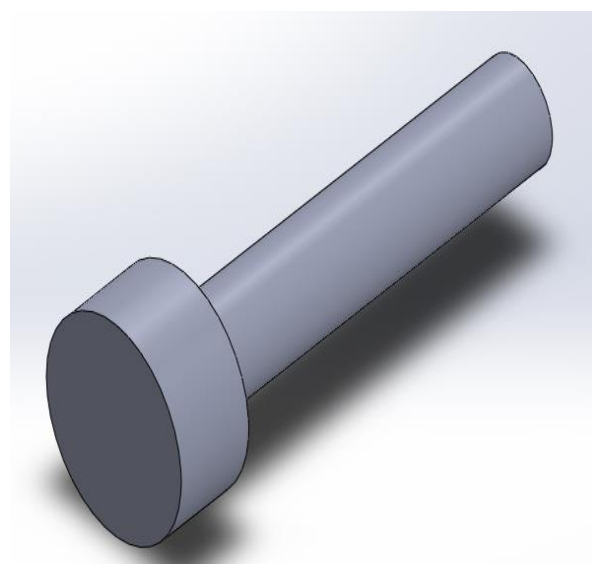
Junk Inlet



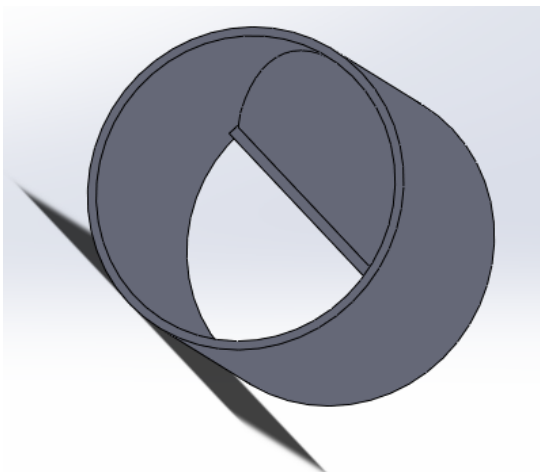
Slider



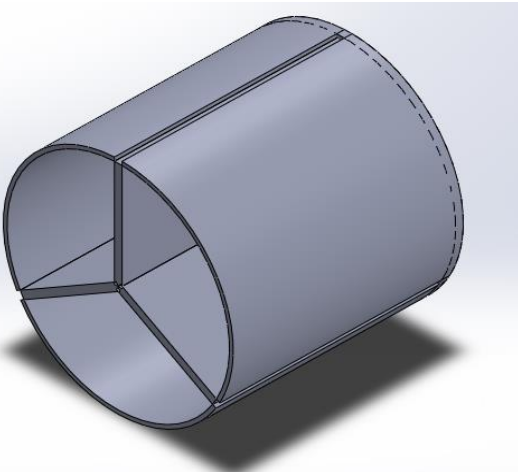
Compressor Box



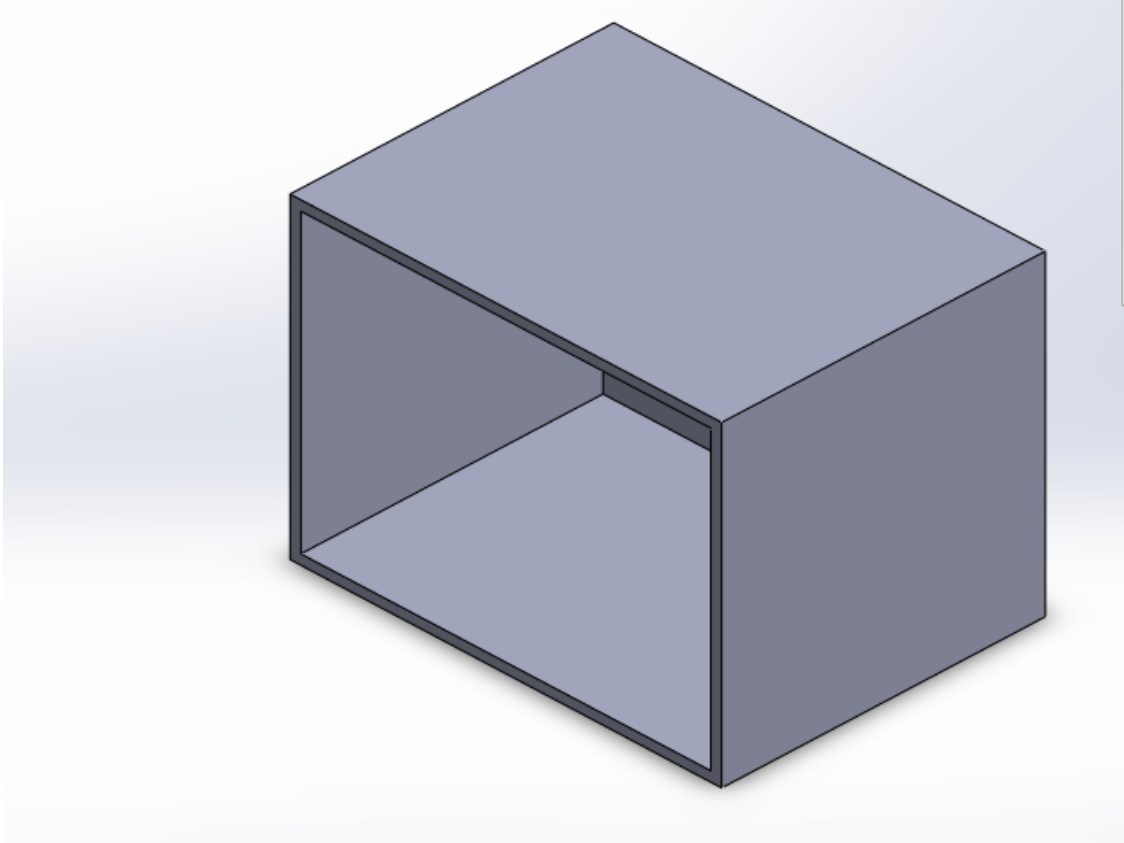
Compressor Rod



Bin Divider

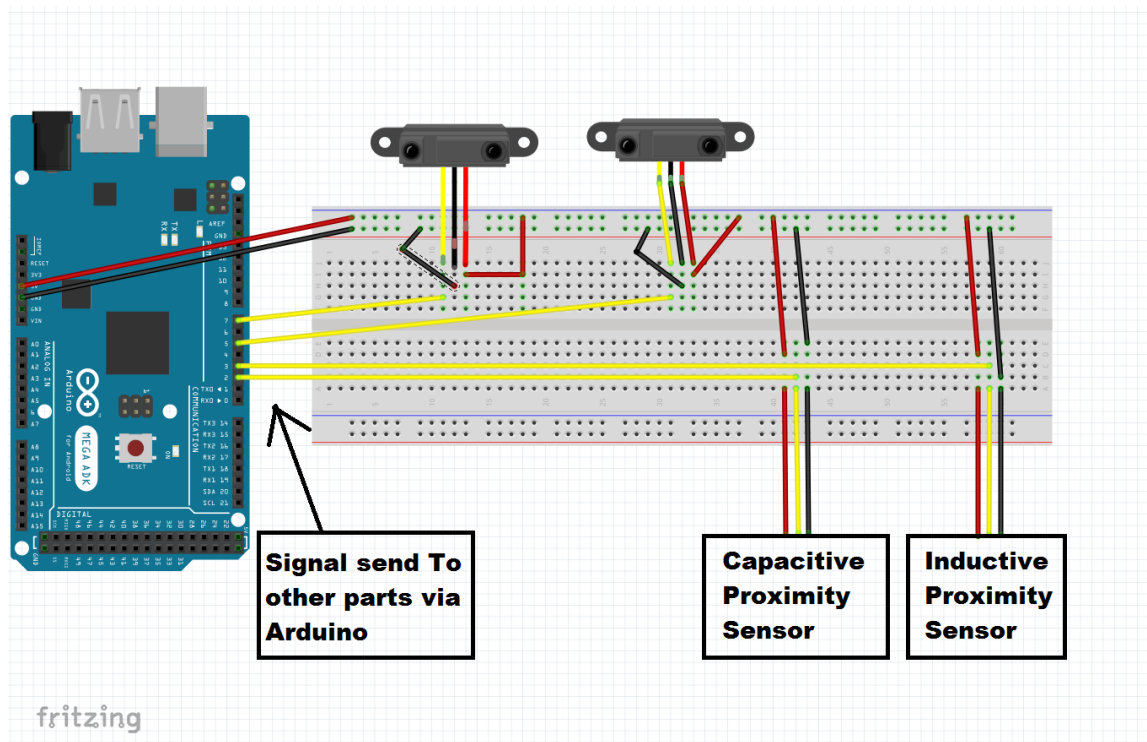


Collector/Storage Bin

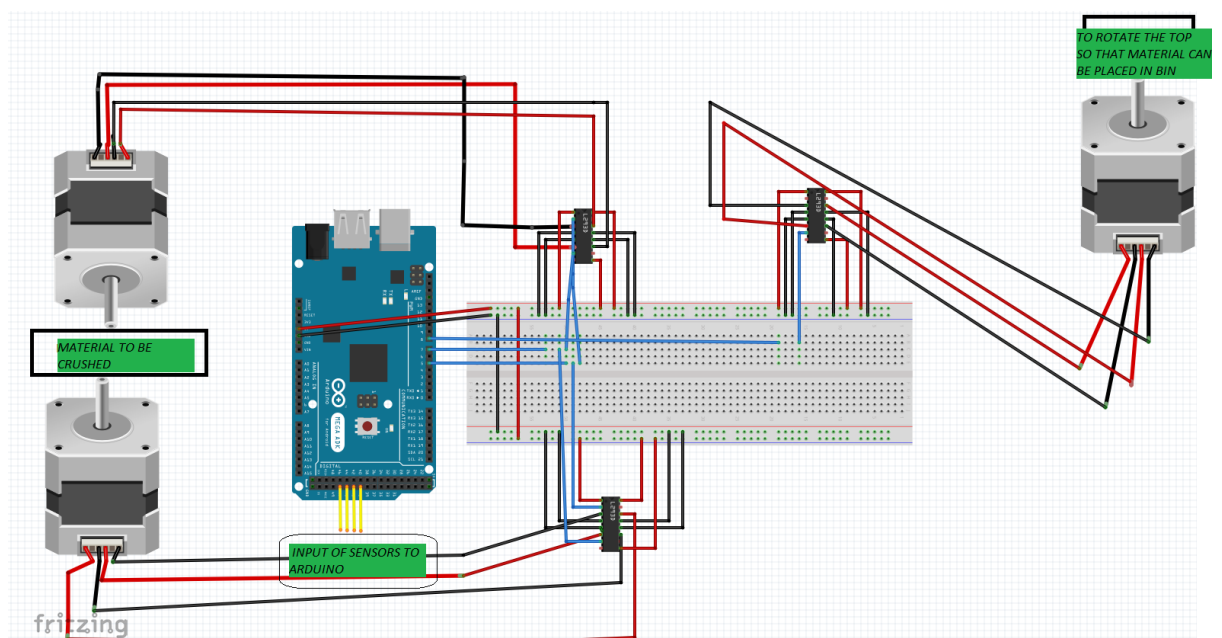


Base

2. Electrical Circuits



Circuit for sensors

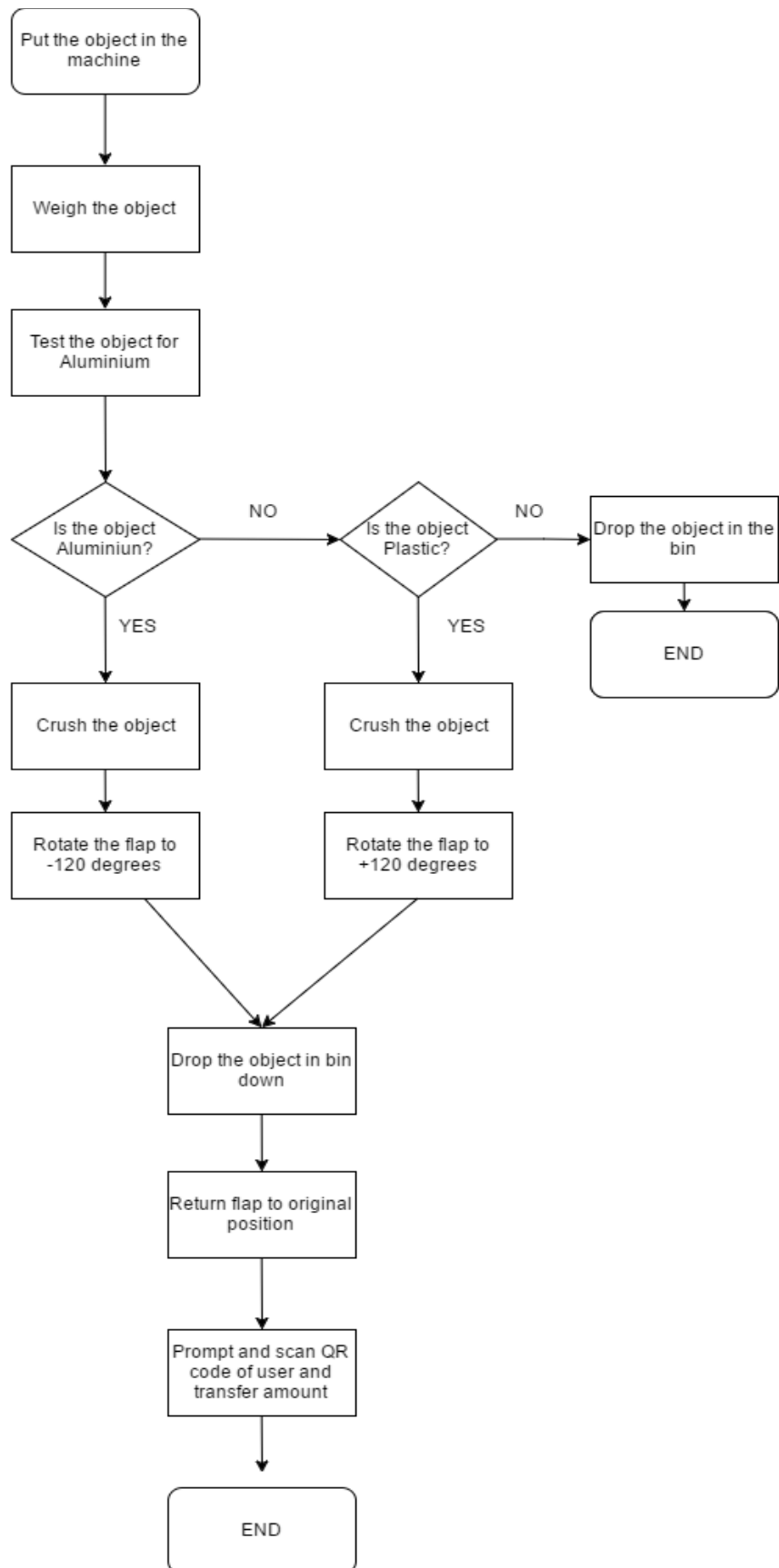


Circuit for Motors Controlling Compressor and Bin Divider

3. Algorithm

- User puts the object in the machine.
- Weigh the object.
- Test for aluminium (metal)
 - If object is aluminium:
 - Crush the object using the crusher.
 - Rotate the flap to -120 degrees.
 - Drop the object in the bin down.
 - Return to original position.
 - Prompt for and scan the paytm QR code of the user.
 - Transfer the appropriate amount in user's paytm wallet.
 - End.
 - Else test for plastic.
 - If object is plastic:
 - Crush the object using the crusher.
 - Rotate the flap to $+120$ degrees.
 - Drop the object in the bin down.
 - Return to original position.
 - Prompt for and scan the paytm QR code of the user.
 - Transfer the appropriate amount in user's paytm wallet.
 - End.
 - Else:
 - Drop the object in the bin down.
 - End.

4. Flowchart



Components Required

1. Raspberry pi 3 - 1
2. Stepper motors – 6
3. Plywood
4. Arduino Mega - 1
5. Weighing Machine
6. High torque motors - 2
7. Raspberry Pi LCD - 1
8. Inductive proximity sensor - 2
9. Capacitive proximity sensor - 2
10. Magnetic proximity sensor - 2
11. InfraRed Sensors – 3
12. Motor Driver (L293D) - 4

Estimated Cost

S. No	Name of Item	Approx cost per item	Quantity	Approx cost
1	Raspberry pi 3	3000	2	6000
2	Metal Body	500	1	500
3	Bluetooth Module	350	5	1750
4	Stepper motor	1000	6	6000
5	plywood	2000	1	2000
6	Nuts and bolts	–	–	500
7	Arduino Mega	900	1	900
8*	Motor Driver(L293D)	200	4	800
9	Infra Red Sensor	100	3	300
10	Weighing Machine	400	1	400
11	High torque motors	1000	2	2000
12	Inductive proximity sensor	750	1	750
13	Magnetic proximity sensor	300	1	300
14	Capacitive Proximity Sensor	1650	1	1650
15	Raspberry Pi LCD	2200	1	2200

Total Cost - 26050

Manufacturing /Assembly process

Electronic junk Dealer has four main parts sensor box, crusher, divider and storage bin. Every branch of Engineering has equal importance in manufacturing of EJD.

The junk input directly into sensor box where sensors are placed. The floor of the segregator will be made of Aluminium so that it makes loud sound when the junk is dropped. The sound sensor will evaluate the sound to identify the items also there will be other sensors like inductive sensor, proximity sensors. The sensors will be placed near to the object as possible. There will be a dragging system which will drag the object to the next part crusher. The dragging shaft will be connected to the motor placed outside the crusher. With the rotation of motor the dragging shaft move linearly so that the object can be dragged to crusher. It will move back after the crusher crush the object. Cast iron will be used to make dragging shaft and aluminium for dragging plate which will have high strength to weight ratio.

The crusher is used to reduce the size of object so that more junk can be stored inside the storage bin. Powerful motors are needed for this part. The mechanism work as changing rotational motion of motor to linear motion of the metal plate. The metal plate and the rod joint to them will be manufactured by cast iron. High strength material is needed for the process. Two plate from each side will move towards each other crushing the object. The floor of the crusher is two doors which will be opened after crushing the object which will fall to the divider. After dropping it the doors will be closed. Small stepper motors are used to open and close the doors. The doors will be made with wood.

The crushed object will be dropped to the desired bin with the help of divider. The shape of the divider is curved and banked by an angle around 45. Only one third of the divider is open to the next part so that item will fall to one corresponding storage bin. The divider can be rotated. A stepper motor is used for the purpose. Just after the segregator identify the material, divider will be rotated to the corresponding position so that the object dropped from the crusher will be directly fall to the storage bin for the object. Aluminium sheet is used for making divider which is easy to bend and make required shape.

The storage bin is cylindrical shaped with three equal columns for the three items paper, plastic and aluminium. The object which pass through the process are separately stored in storage bin. The storage bin will be made of plastic. It can be removed and replaced any time. There will be sensors on it to check whether it is full or not. When the bin is filled, the machine will send a message informing the same.

Timeline Progress

1									
2				Electronic Junk Dealer	56d	03/03/17	05/19/17	In Progress	
3				Start Date	1d	03/11/17	03/11/17	Complete	
4									
5				Permission to schedule work	1d	03/11/17	03/11/17	Complete	
6									
7				Collecting Resources and material	9d	03/14/17	03/24/17	Complete	
8				Getting arduino and other thing	4d	03/14/17	03/17/17	Complete	
9				Arranging conveyor belt and other mechanical part	6d	03/18/17	03/24/17	Complete	
10									
11				Combining resources	19d	03/25/17	04/19/17	In Progress	
12				major outer structure	5d	03/25/17	03/30/17	In Progress	
13				Placing conveyor belt and other component	3d	03/31/17	04/04/17	In Progress	
14				Combining Electrical component	11d	04/05/17	04/19/17	In Progress	
15									
16				coding	11d	04/20/17	05/04/17	Not Started	
17				coding for arduino and raspberry	7d	04/20/17	04/28/17	Not Started	
18				Testing of code in-place	5d	04/29/17	05/04/17	Not Started	
19									
20				Testing and implementation	10d	05/05/17	05/18/17	Not Started	
21				Testing of assembled part	6d	05/05/17	05/12/17	Not Started	
22				Repairing parts	5d	05/12/17	05/18/17	Not Started	
23									
24				Final display	3d	05/19/17	05/23/17	Not Started	
25				Display to mentor	1d	05/19/17	05/19/17	Not Started	
26				Displaying at open house	1d	05/21/17	05/21/17	Not Started	
27								Not Started	

Conclusion

The project aims to build efficient and automated alternative to conventional bins in which the biodegradables and non- biodegradables get mixed up. It also helps in awareness of people to keep the society clean and healthy. One of the biggest advantage is that we can efficiently dispose-off the non-biodegradable which are one of the greatest enemies of the Earth. The project is such that it could be deployed in colleges, institutes, etc. for keeping the vicinity area clean and green.

References

1. <http://ijariie.com/AdminUploadPdf/SEGREGATION OF RECYCLABLE WASTE MATERIALS ijariie1831.pdf>
2. <https://www.youtube.com/watch?v=v95Ifjz9sSg>
3. <http://www.popsoci.com/technology/article/2013-07/how-it-works-recycling-machines-separate-junk-type>
4. <https://www.google.co.in/url?sa=t&rct=j&q&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwiOjvKG0f7SAhWlQI8KHWCiARkQFggZMAA&url=http%3A%2F%2Fijariie.com%2FAdminUploadPdf%2FSEGREGATION OF RECYCLABLE WASTE MATERIALS ijariie1831.pdf&usg=AFQjCNFcPvdTksSxo-wYJ4HyWJTtvtOERA&sig2=iEDgiyjMN0kgoOeoY9FpDQ&bvm=bv.151325232%2Cd.c2I>