



S.O.R.T.

Smart Object Recycling Tote

Team 6 Members:
Mike Dembinski, Faisal Esmail, Brett Sartor

University of Houston-College of Technology
ELET 4308-01
Fall 2008 Senior Project

Overview

- Purpose*Brett Sartor*
- Background and Motivation*Brett Sartor*
- Project Description*Brett Sartor*
- Design Overview*Mike Dembinski*
- Sensor Specification*Faisal Esmail*
 - Induction Proximity Sensor
 - Optical and Weight Sensor Comparator
- Three Bit Comparator Plate.....*Faisal Esmail*
- Hardware Design*Faisal Esmail*
- Software Design*Mike Dembinski*
- Pictures / Project Schedule*Mike Dembinski*
- Cost Analysis*Mike Dembinski*
- Questions*Team*

Purpose:

- **Fact: Only 18% of the world's population recycle any item**
 - **People think recycling is a hassle**
 - **Deciding which items are recycled together**
- **Make recycling convenient and easy**
- **Develop an all-in-one recycling solution**
- **Saves space, time, and money for consumers and industries**

Motivation:

- Motivation for this project came from the growing trend to “Go Green.”
 - Pollution and slow decomposition of trash negatively affects the environment
 - The world’s population keeps increasing, making less space for trash disposal in landfills.
- Recycling allows industries to reuse materials, thus lowering costs.
- Industries and Consumer markets are looking for ways to be more environmentally friendly.

Project Description:

• *Sorted Items*

- Clear / Translucent Plastics
- Glass
- Aluminum / Tin / Stainless Steel
- Unrecognized or Non-recyclable items



S.O.R.T

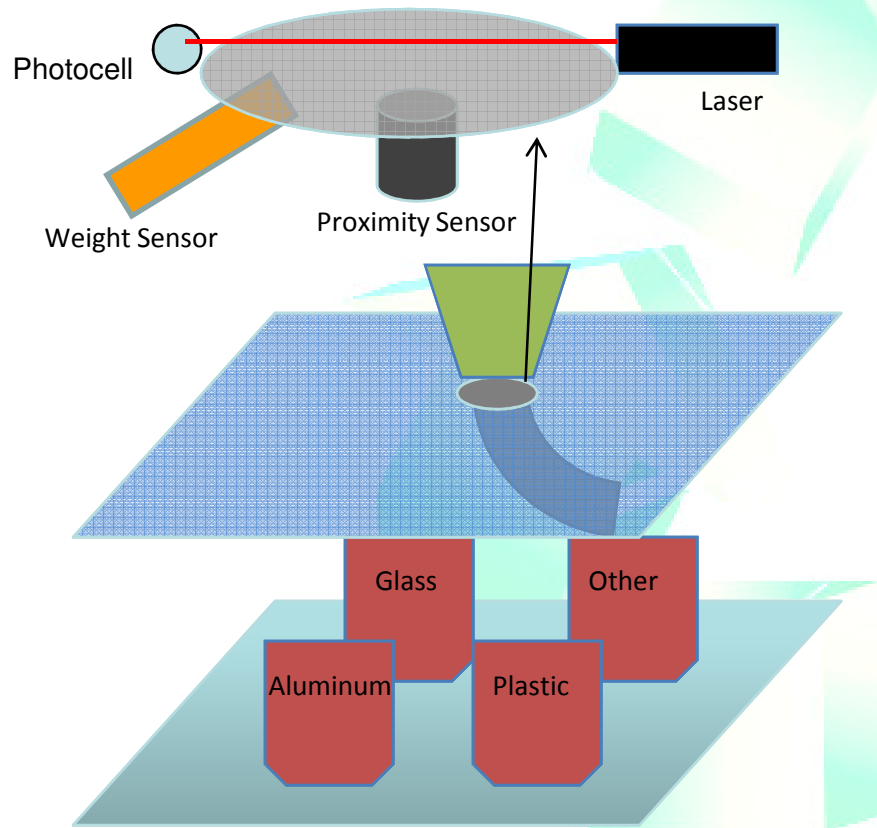
Smart Object Recycling Tote

University of Houston - College of Technology

Team 6

December 4, 2008

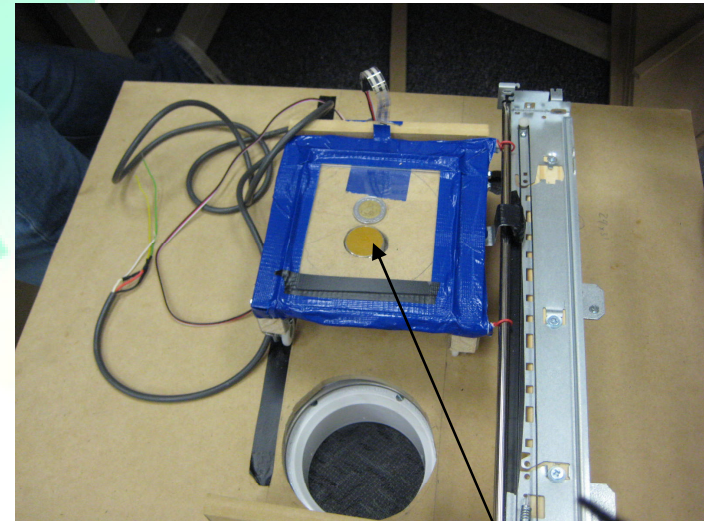
Design Overview:



Sensor Specifications:

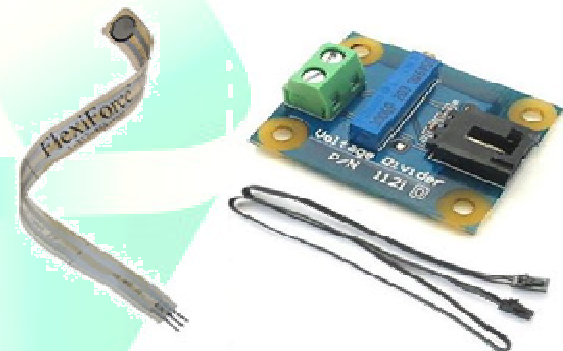
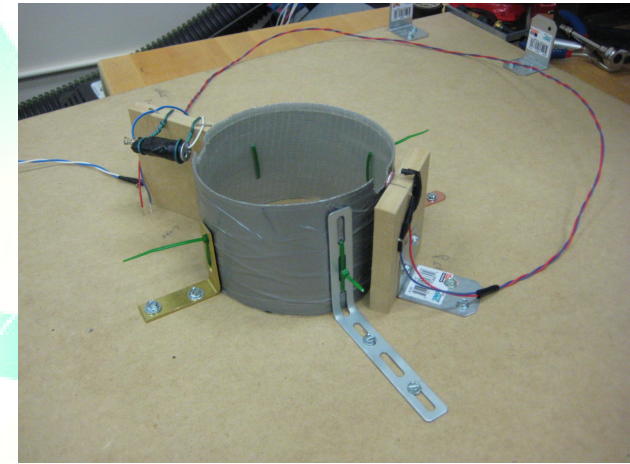
Induction Proximity Sensor

- Detects Ferrous and Non-Ferrous metals
- Range approx 1cm
- Voltage input range 10– 30 Vdc
- Offers up to three times the detection as compared to other inductive sensors
- Shielded for flush mounting in metal
- Shielded twisted cable used for noise reduction



Laser, Photocell, and Weight Sensor Comparator

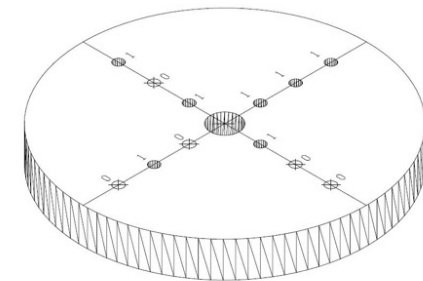
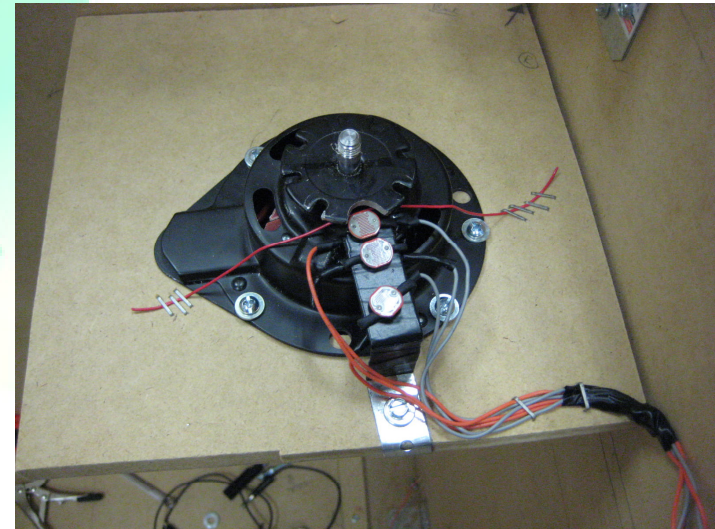
- Detects transparent and translucent objects.
- Functionality based on laser going through the object, hitting the photocell.
- If transparent plastic or glass is detected
 - FlexiForce will be used to differentiate.
- A weight threshold will be programmed.
- Weight threshold from 0 to 5V with a linear range of 0 – 1 lbs



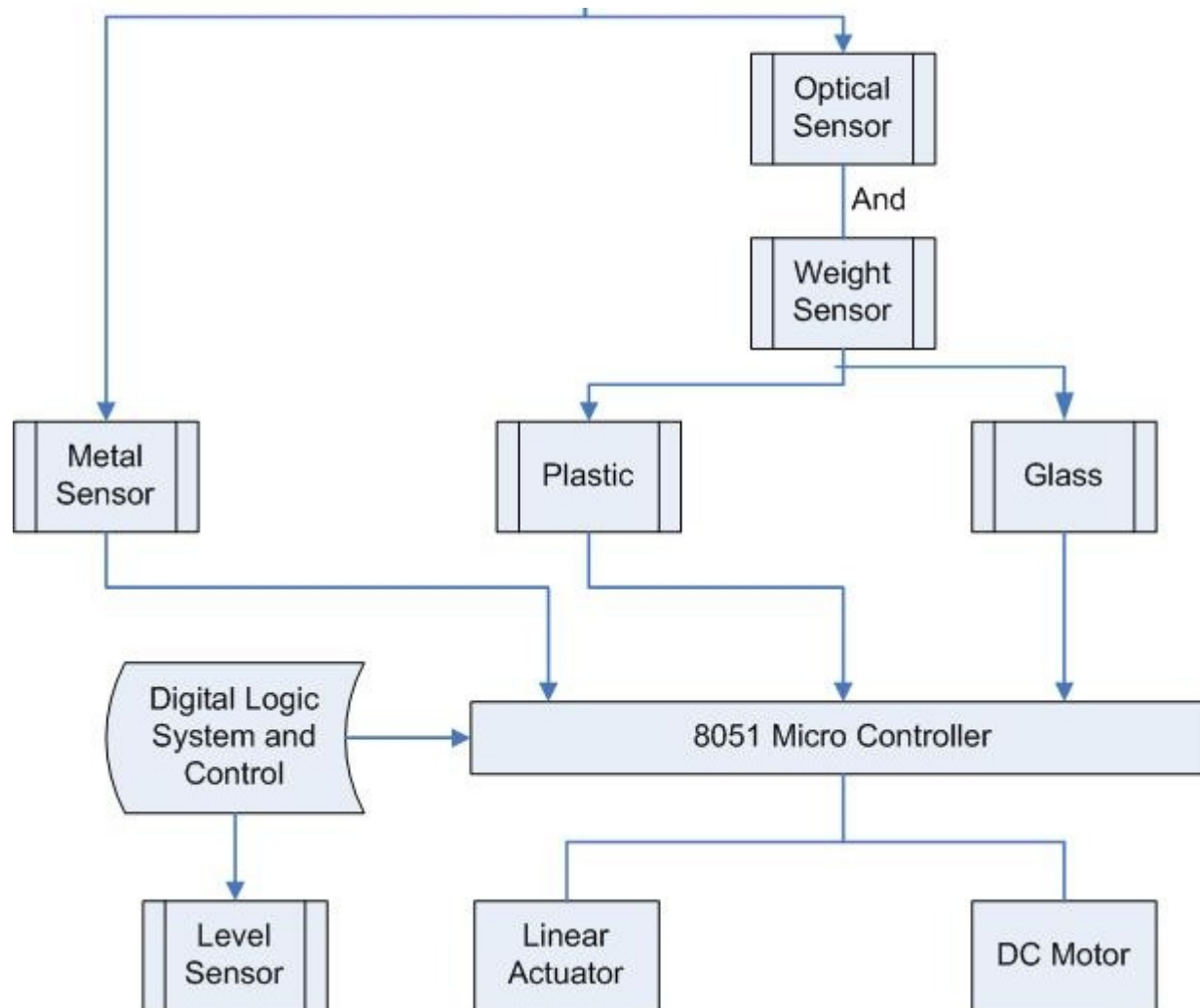
FlexiForce:
www.trossenrobotics.com

Three Bit Comparator Plate

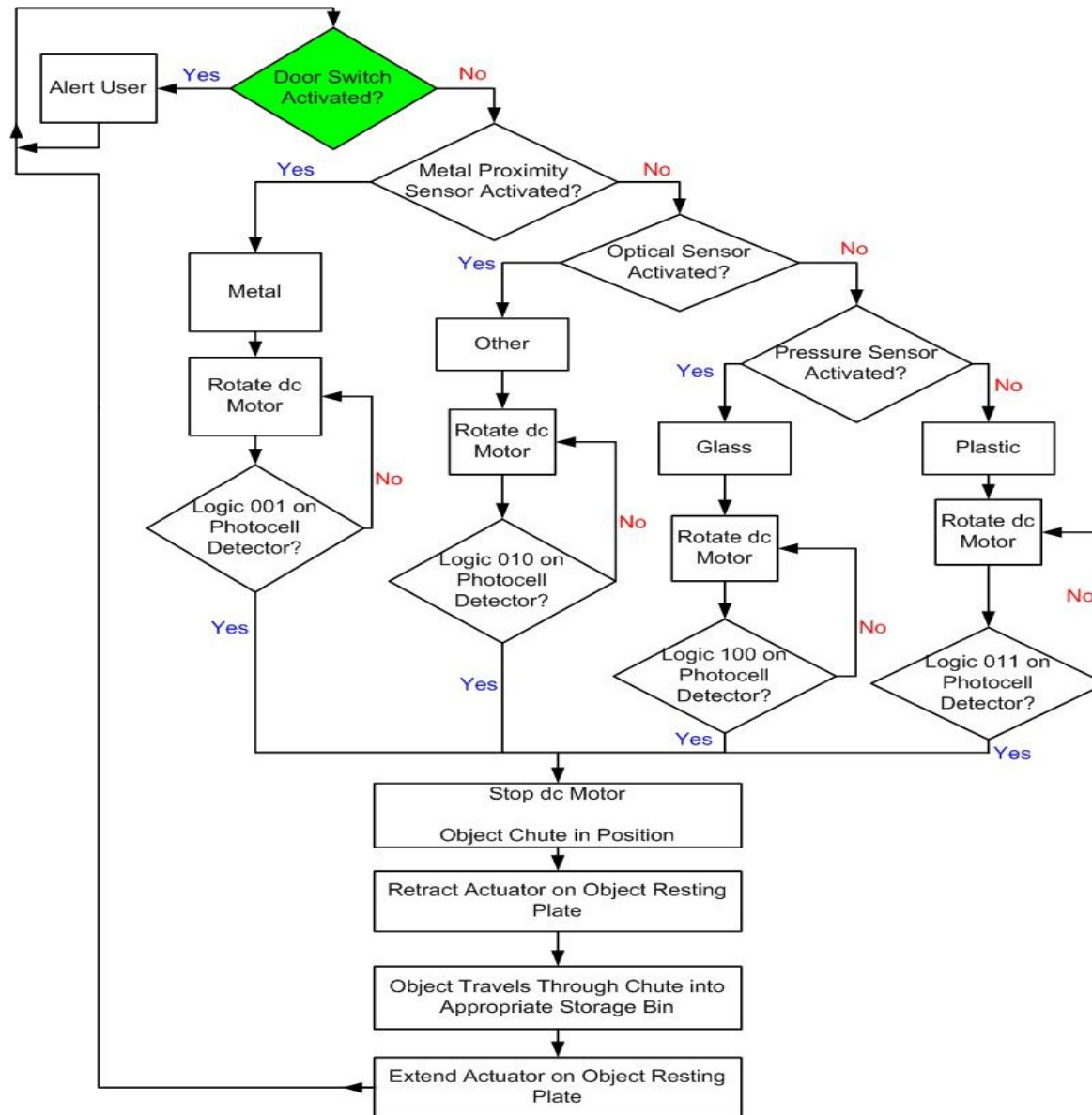
- Four sets of comparing holes in plate
 - 001
 - 010
 - 100
 - 011
- Plate rotates, which rotates chute
- LED's shine through holes to light up photocells
- Motor stops rotating plate at appropriate code
- Chute is in position to drop object to appropriate bin



Hardware Block Diagram



Software Flowchart



S.O.R.T

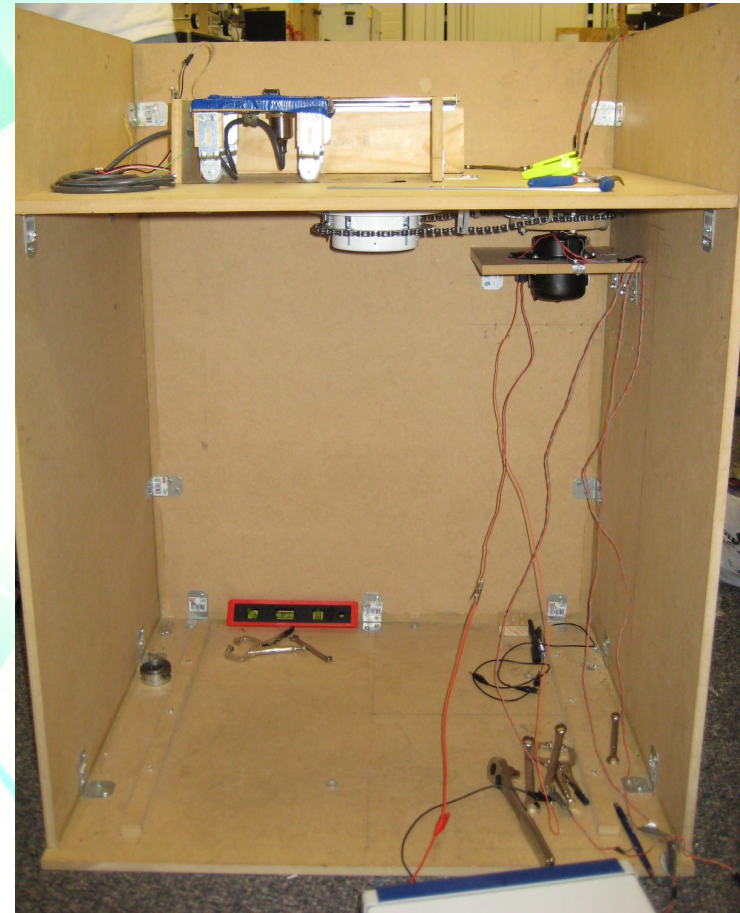
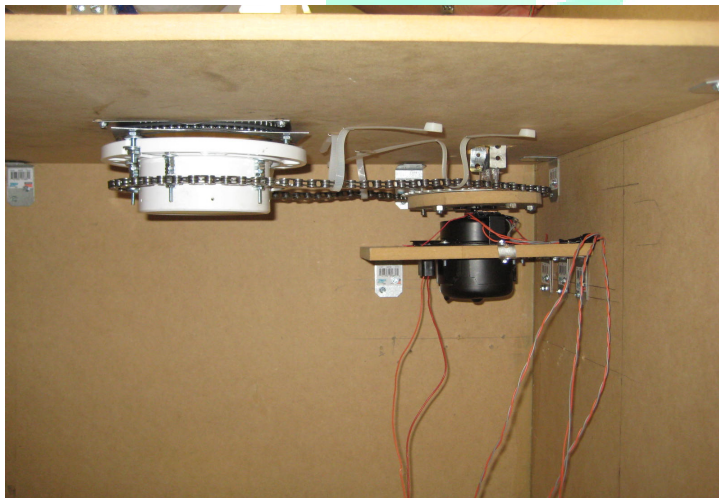
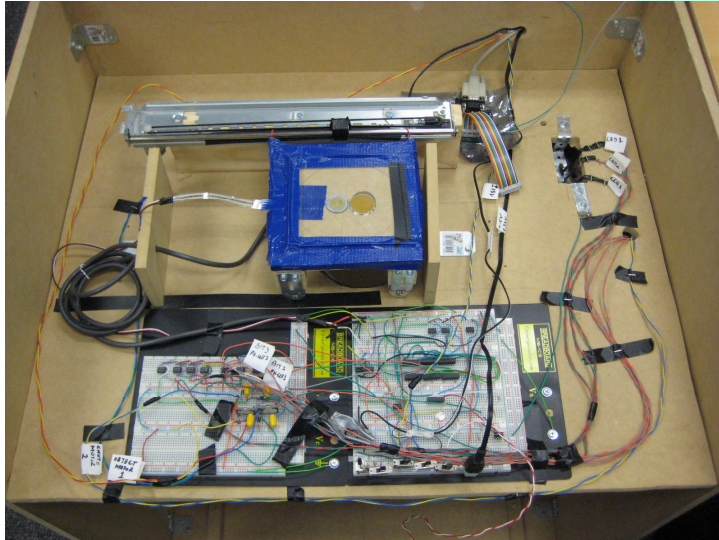
Smart Object Recycling Tote

University of Houston - College of Technology

Team 6

December 4, 2008

Pictures



Project Schedule

- **Planning**
 - **August 26, 2008 – September 16, 2008**
- **Design**
 - **September 17, 2008 – November 4, 2008**
- **Implementation**
 - **November 5, 2008 – November 30, 2008**
- **Final Testing**
 - **December 1, 2008 – December 3, 2008**

Costs Analysis

Parts		
Item	Quantity	Total
Radiator Fan Motor	1	\$32.16
Proximity Sensor for Metal	1	\$39.95
FlexiForce Weight Sensor	1	\$25.66
Buckets	4	\$25.88
Handheld Laser & LED light	1	\$2.47
LED lights	3	\$8.37
Photocells	4	\$2
Sprocket	2	\$52.00
Bicycle Chain	1	\$18.00
Lazy Susan Turntable	1	\$6.23
8051 Microcontroller	1	\$69.95
Electronic Components		\$126.52
Building Materials		\$160.85
	Total	\$570.04

Lab Equipment Cost Analysis		
Item	Quantity	Cost
BK Precision DC Power Supply	1	\$689.00
BK Precision 5 1/2 Digit Multimeter	1	\$695.00
Soldering Kit	1	\$25.00
NI MultiSim Software	1	\$1,549.00
Autodesk Autocad 2008	1	\$1,195.00
	Total	\$4,153.00

Cost Analysis

Labor Cost Analysis			
Engineer	Salary	Estimated Hours	Estimated Cost
Michael Dembinski	\$30/hr	235	\$7,050.00
Faisal Esmail	\$30/hr	235	\$7,050.00
Brett Sartor	\$30/hr	235	\$7,050.00
Total		705	\$21,150.00

Total Cost Analysis	
Item	Cost
Parts	\$570.04
Labor	\$21,150.00
Equipment	\$4,153.00
Total	\$25,873.04

We Recycle!

