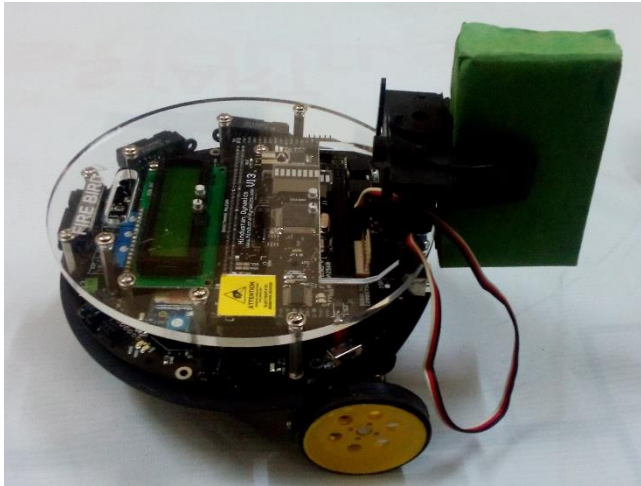


Library Helpmate FIREBIRD V

TEAM ID- 104



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Motivation

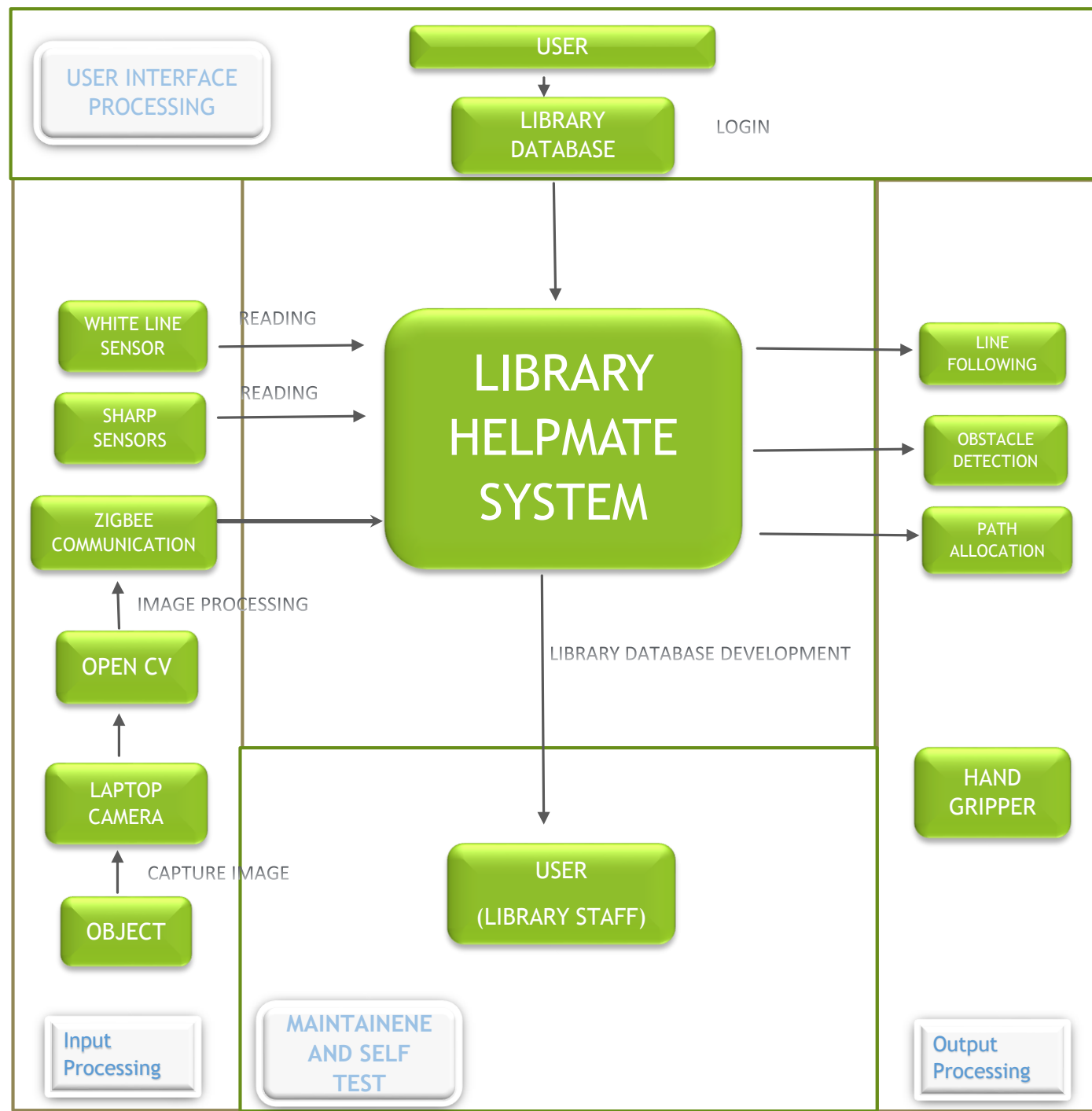
- ▶ The problems faced by the book management staff in The Central Library and the students of IIT Bombay was the motivation for our project. Every library faces issues regarding wrong placing of books and, the labour and time involved in manual book management.

Problem Statement

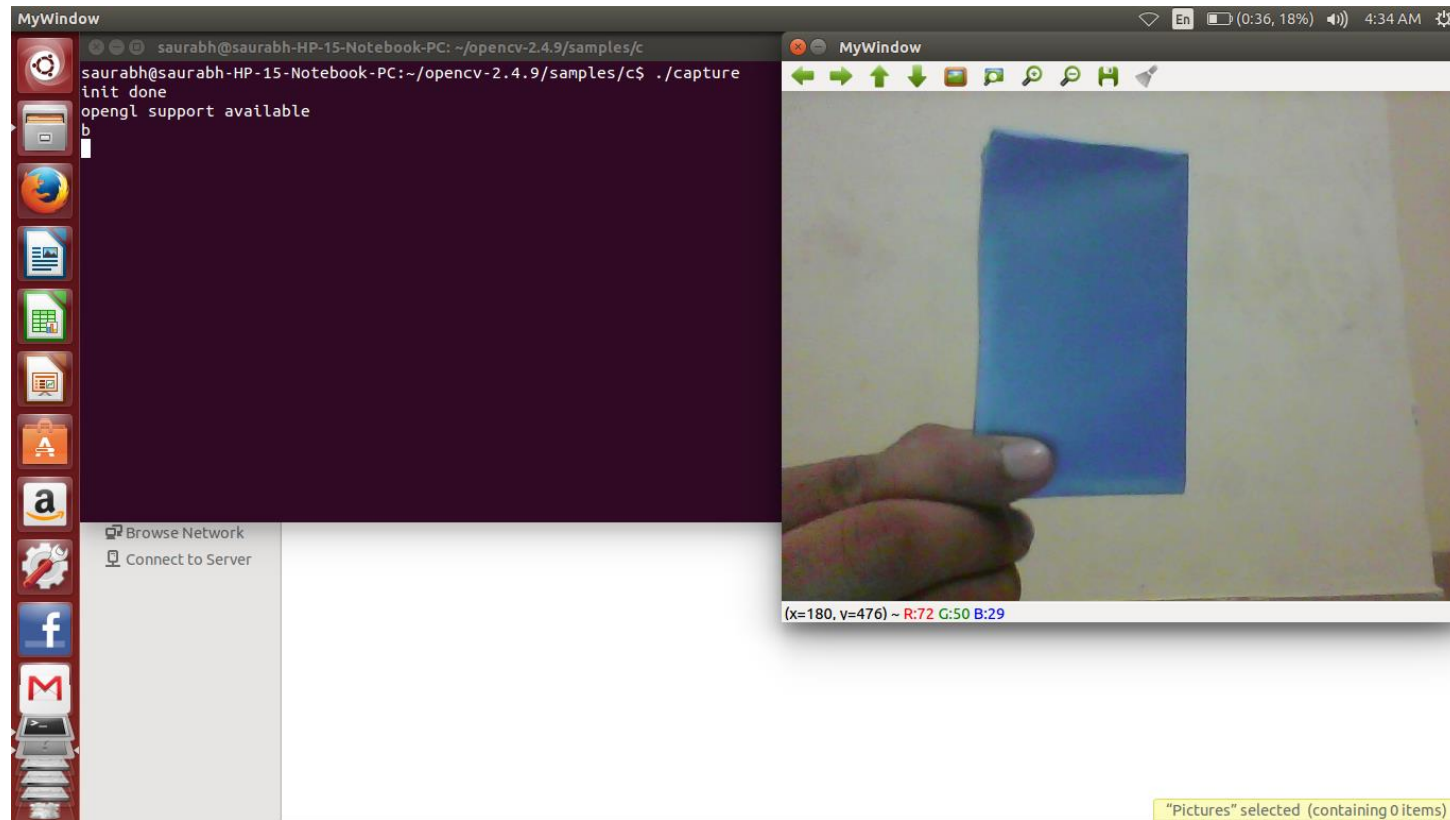
- ▶ Development of library helpmate bot with the work of keeping unattended books at their designated location.

Our goals were-

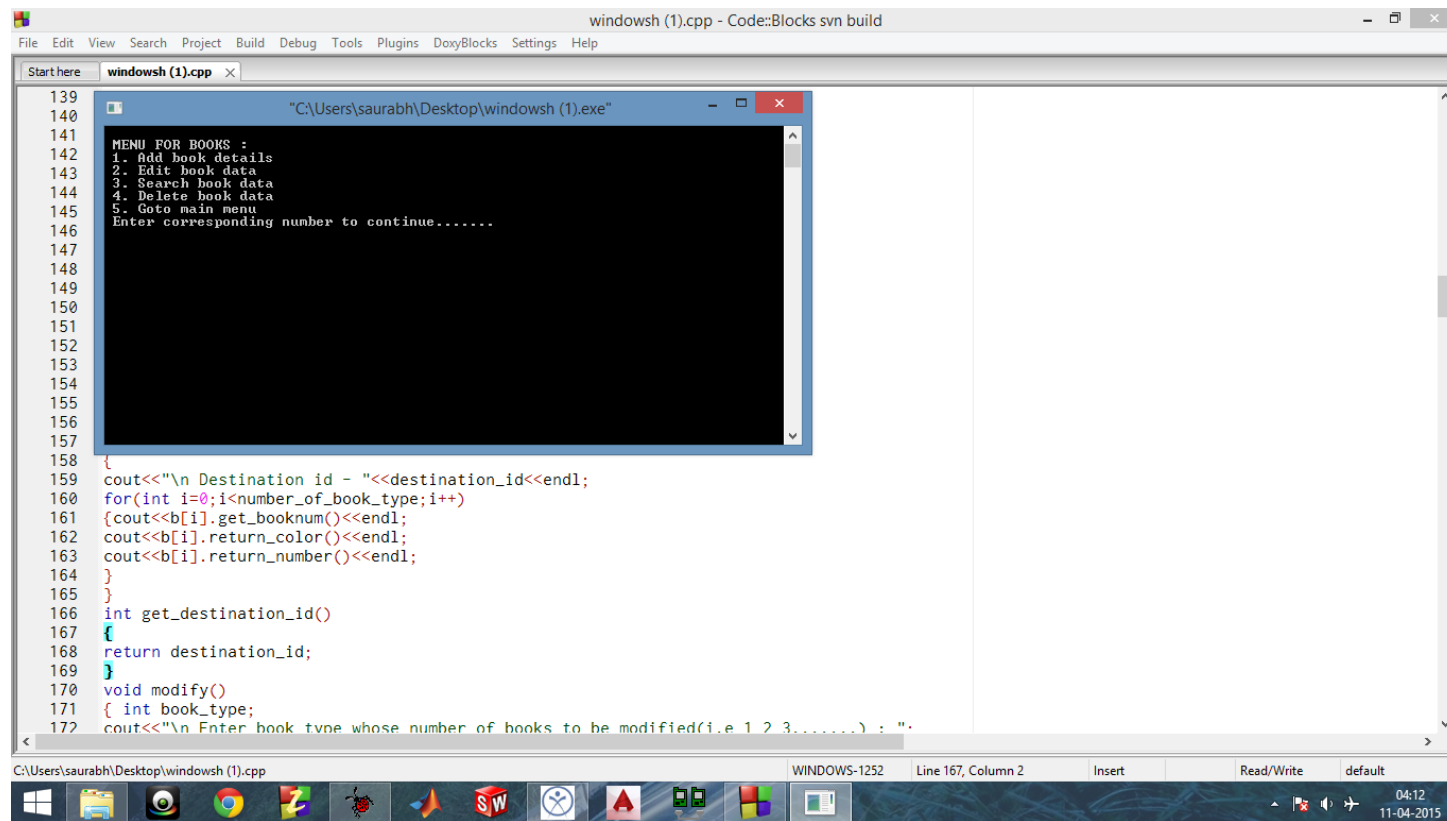
- ▶ Develop a library database
- ▶ Detect the color of a book using image processing and locate destination
- ▶ Communicate with FIRE BIRD V using Xbee
- ▶ Use line following for motion of bot
- ▶ Detect and circumvent obstacles in the path
- ▶ Use gripping mechanism to clasp books



Book Identification

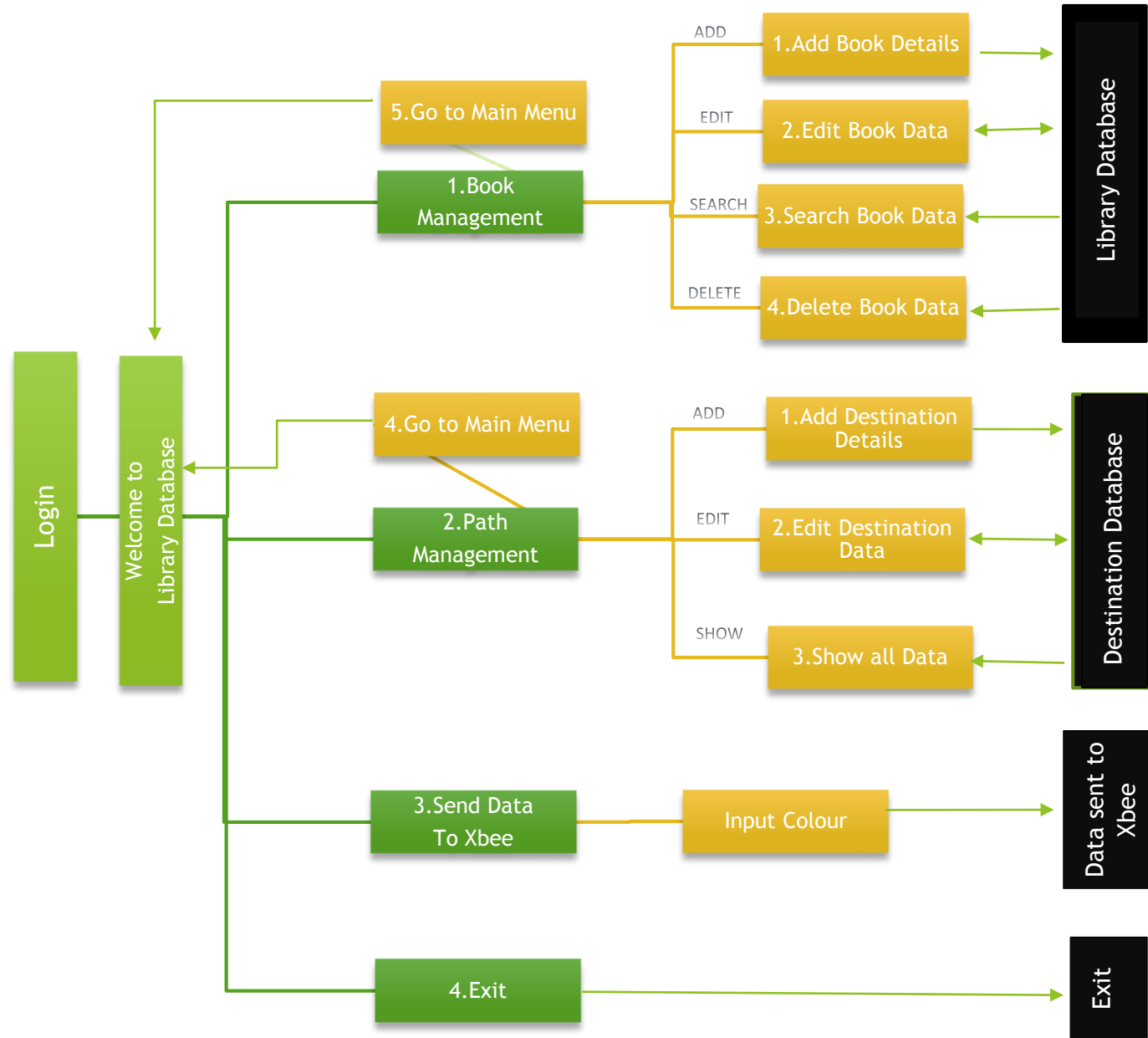


Library Database



```
139
140
141
142 MENU FOR BOOKS :
143 1. Add book details
144 2. Edit book data
145 3. Search book data
146 4. Delete book data
147 5. Goto main menu
148 Enter corresponding number to continue.....
149
150
151
152
153
154
155
156
157
158 {
159 cout<<"\n Destination id - "<<destination_id<<endl;
160 for(int i=0;i<number_of_book_type;i++)
161 {cout<<b[i].get_booknum()<<endl;
162 cout<<b[i].return_color()<<endl;
163 cout<<b[i].return_number()<<endl;
164 }
165 }
166 int get_destination_id()
167 {
168 return destination_id;
169 }
170 void modify()
171 { int book_type;
172 cout<<"\n Enter book type whose number of books to be modified(i.e 1 2 3.....) : ";
```

Functionality of Database



Wireless Communication using XBee

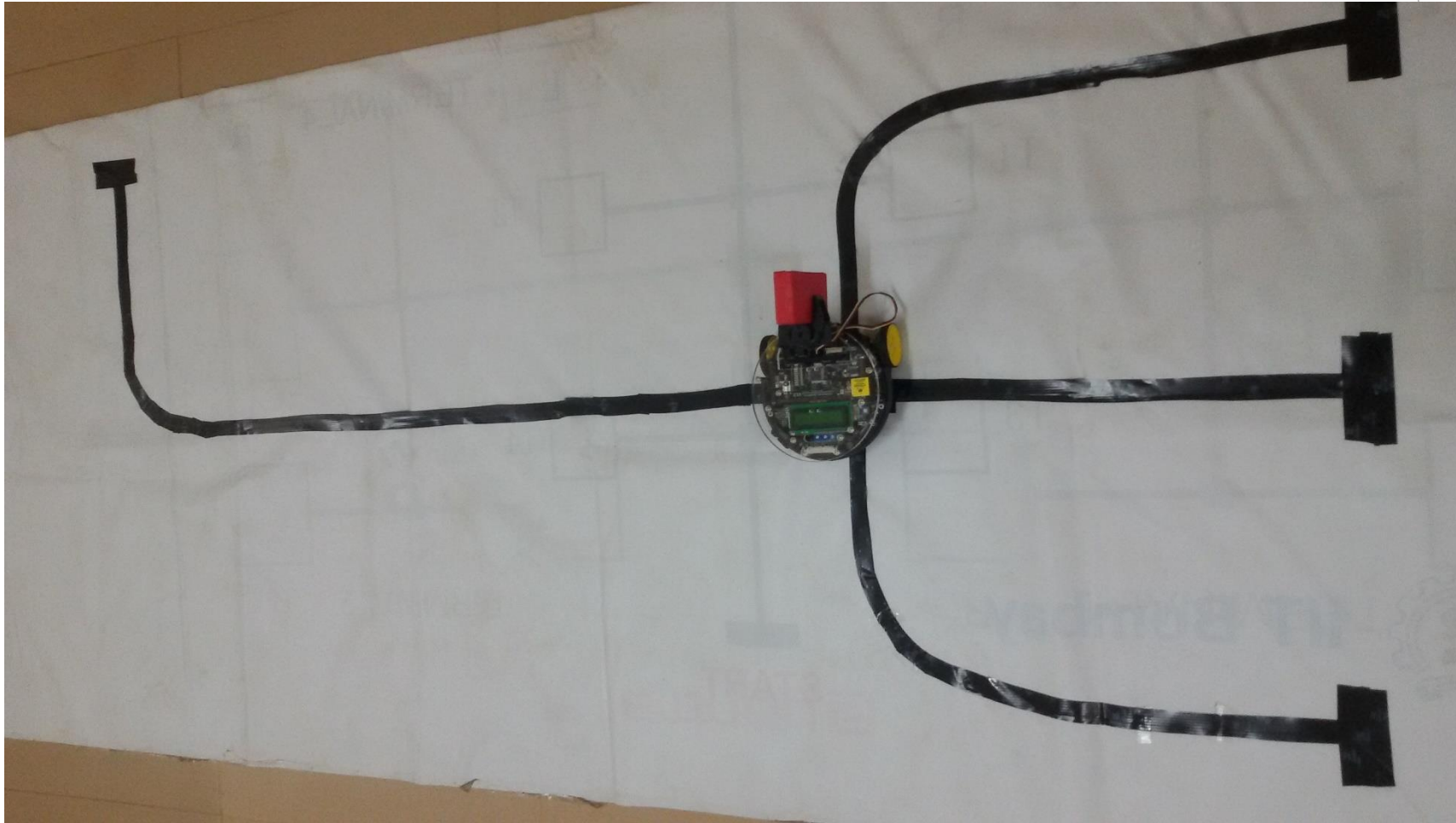


```
Code::Blocks svn build
File Edit View Search Project Build Debug Tools Plugins DoxyBlocks Settings Help
Start here windowsh (1).cpp x
139 cout<<"\n Destination Id : ";
140 cin>>destination_id;
141 cout<<"\n Enter number of book type for this destination(max 10)";
142 cin>>i;
143 number_of_book_type=i;
144 while(j<number_of_book_type)
145 {
146     cout<<"\n Enter the colour b";
147     b[j].get_color();
148     j++;
149 }
150 if(destination_id==1)
151     directio
152 else if(destination_id==2)
153     directio
154 else
155     directio
156 }
157 void put
158 {
159     cout<<"\n";
160     for(int i=0; i<number_of_book_type; i++)
161     {cout<<b[i].return_color()<<endl;
162     cout<<b[i].return_number()<<endl;
163     }
164 }
165
166 int get_destination_id()
167 {
168     return destination_id;
169 }
170 void modify()
171 { int book_type;
172   cout<<"\n Enter book type whose number of books to be modified(i.e 1 2 3.....) : ";
```

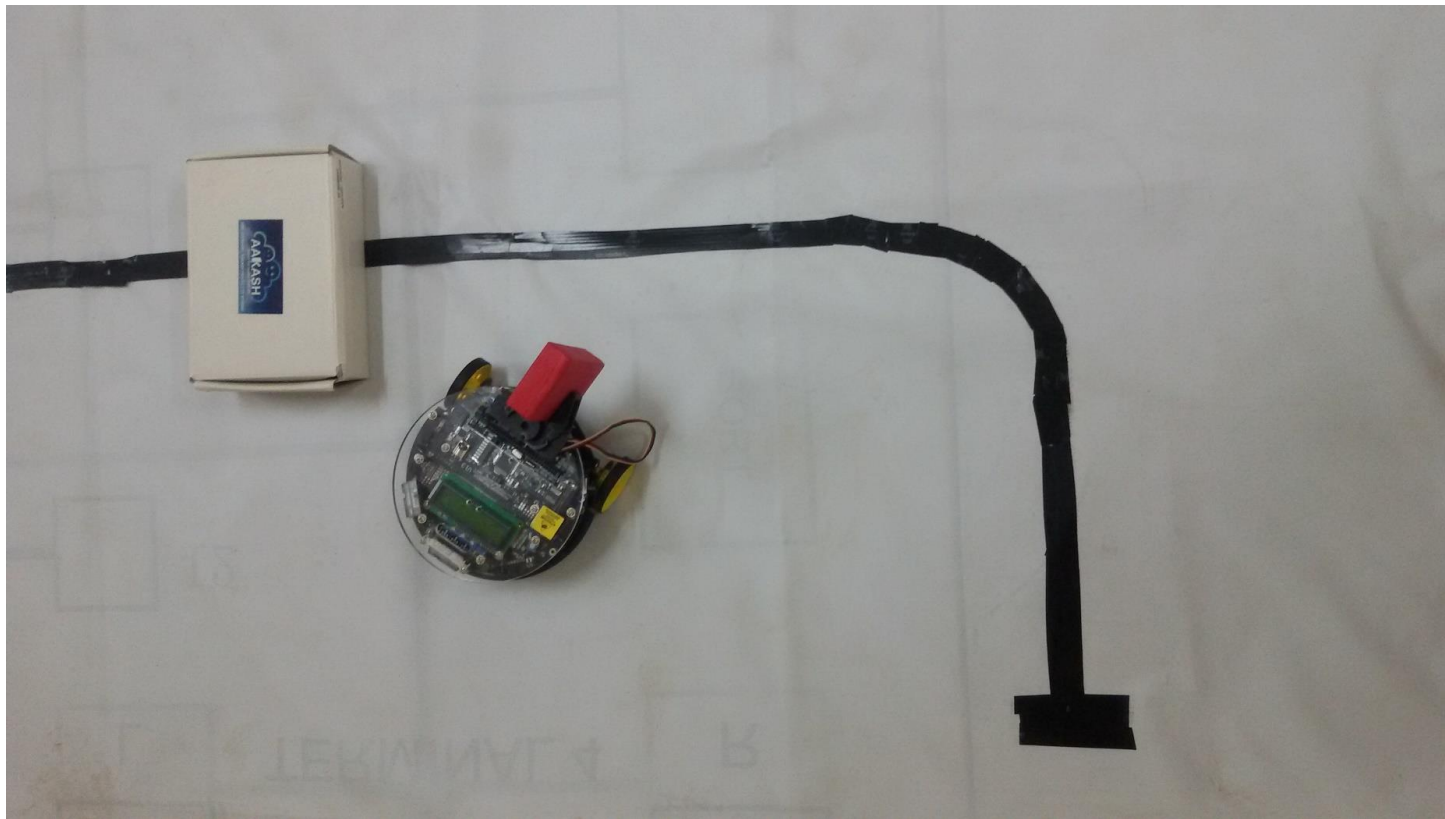
Execution output window: "C:\Users\saurabh\Desktop\windowsh (1).exe"

```
Enter the colour b
Data Sent
Data Received::52
Process returned 0 (0x0)   execution time : 81.082 s
Press any key to continue.
```

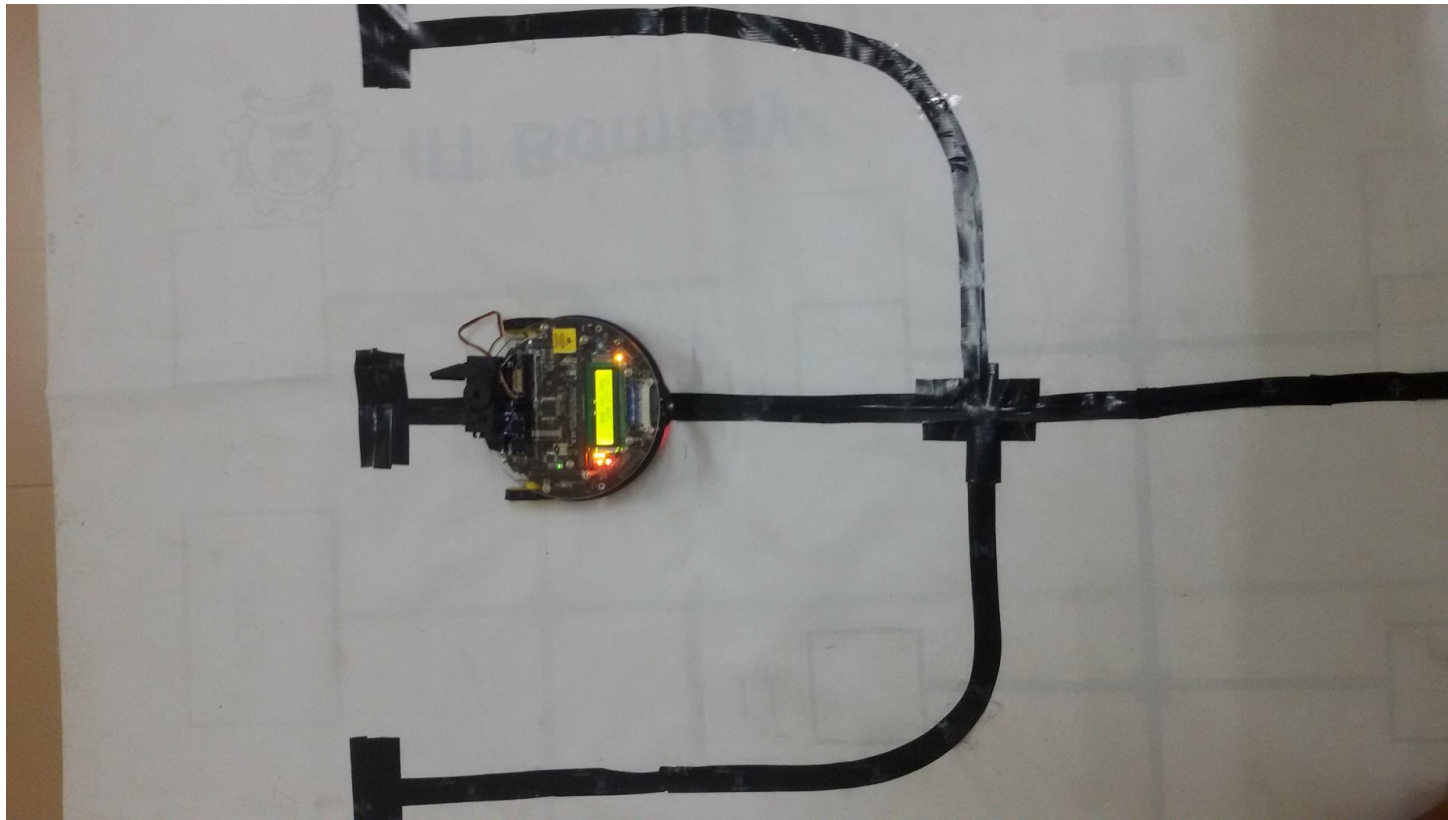

Choosing the designated path

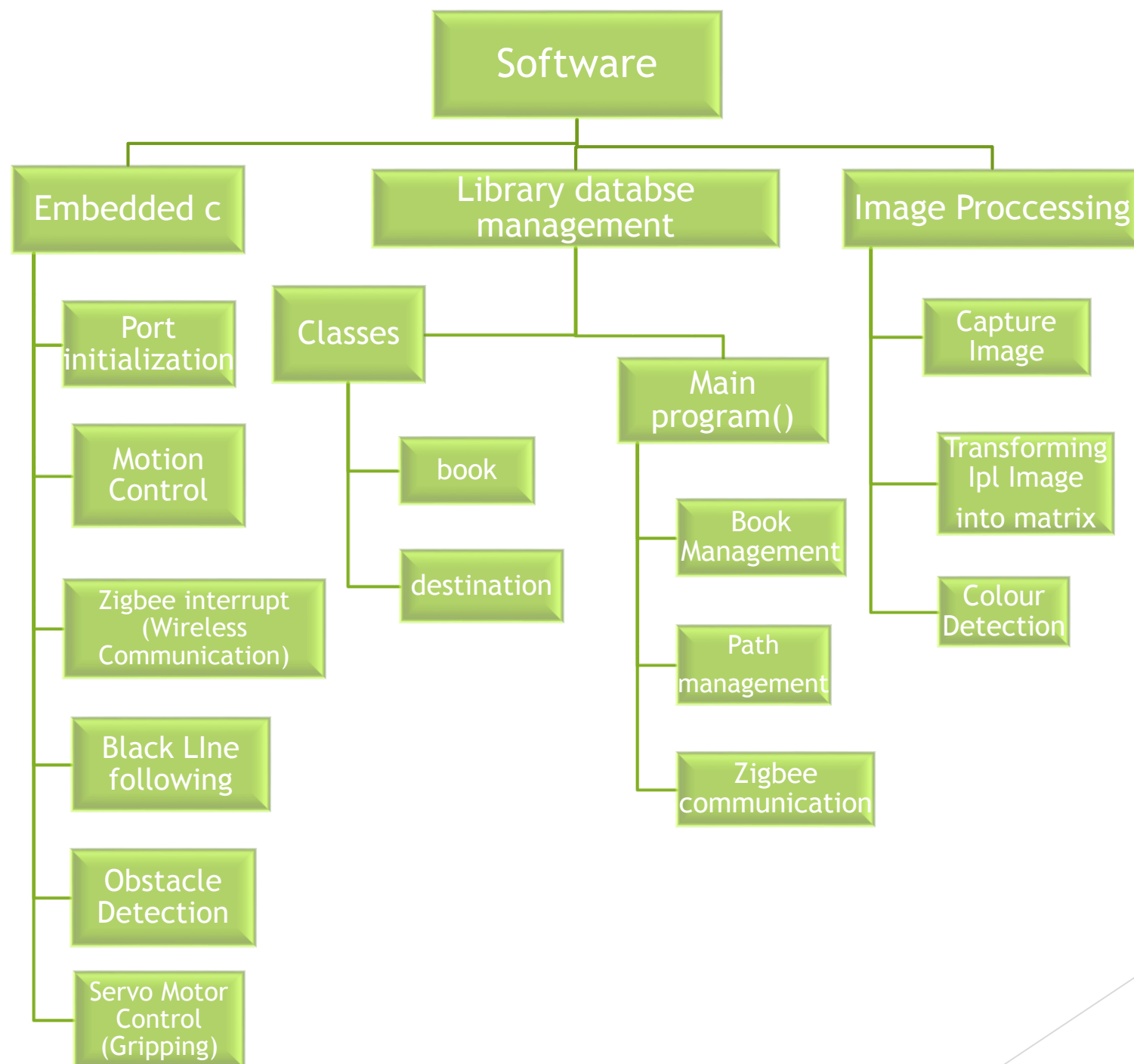


Circumventing the obstacle



Line Following





Challenges

Challenge Name	Challenge Description	Amelioration
1.Installing Open CV	Installing Open CV library using MinGW and C-make in Windows OS	Switched to Ubuntu
2.Using XBee for wireless communication	Accessing port using libXbee	Inclusion of windows.h header file
3.Line following	Inaccurate turning by the bot	Using Proportionality of previous errors
4.Ignoring of checks by bot	Due to delay present in a function in the loop	Increasing thickness of line and checks
5.Reading same check twice	Due to the backward motion included in line following	Increasing delay for forward movement after detecting the check
6. Unable to detect exact color of the object	Due to inexact images captured by the camera	Using better algorithm and limiting down to detection of only three color(RBG)
7. Database	Creation of multiple copies of the data in a file while adding in database	Adding the read function of the file in check condition of the while loop

Future Work

- ▶ 1. Better methods of book detection and expanding the range of colors from RGB to all the colors or use of barcode instead of color as means for identification of book.
- ▶ 2. More Sophisticated line following by implementing PID (proportional-integral-derivative) controller.
- ▶ 3. Automated hand mechanism like using RF-ID such that the gripper detects the books and carry them to their designated locations automatically.