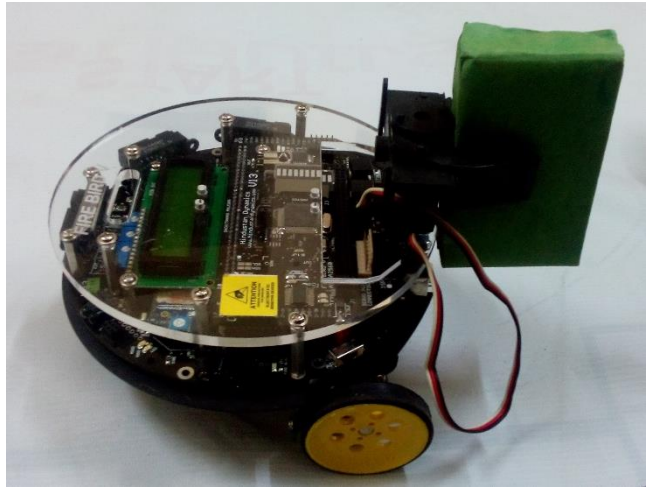
Library Helpmate FIREBIRD V



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Motivation

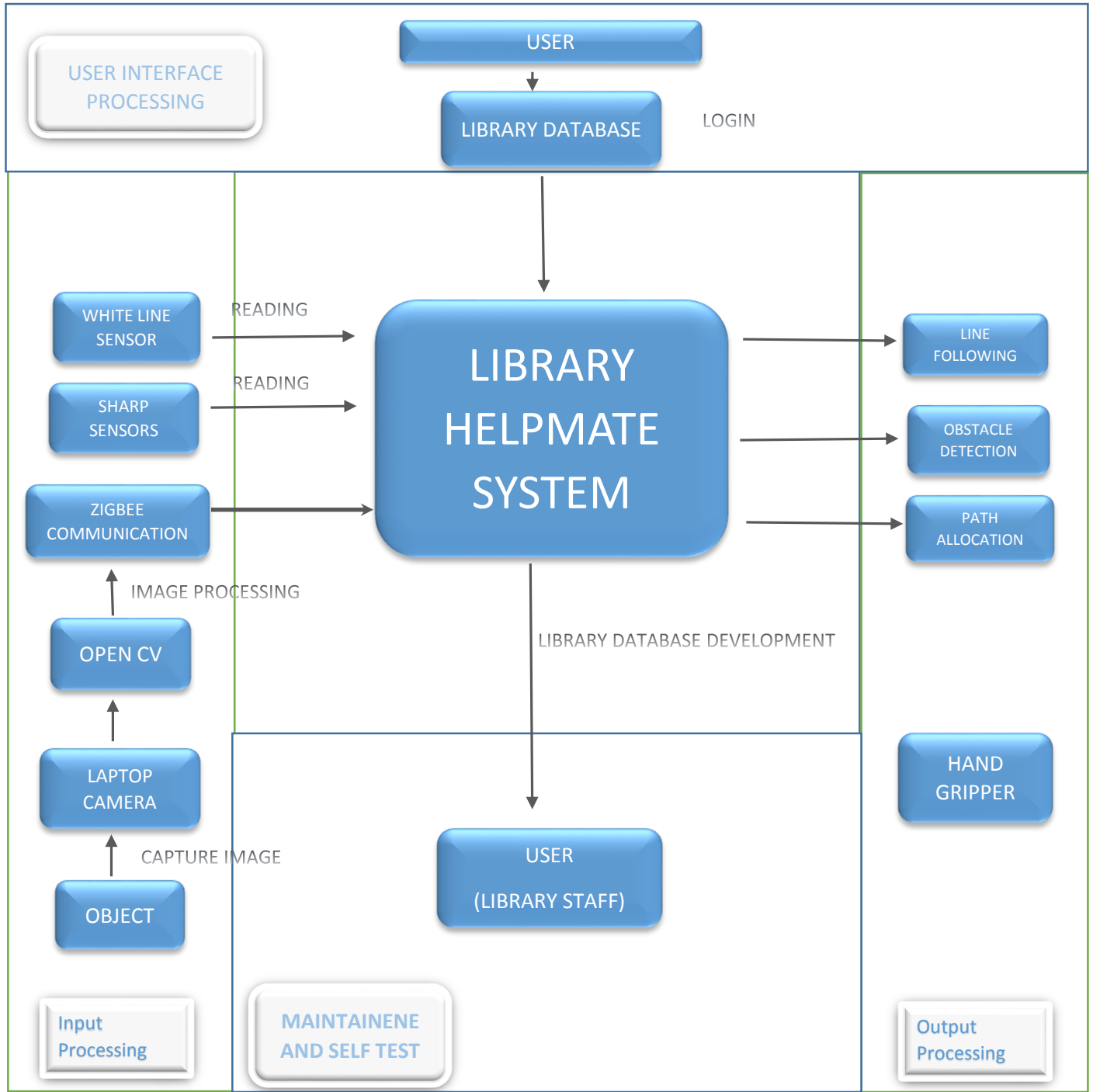
- The problems faced by the book management staff in The Central Library and the students of IIT Bombay was the motivation for our project. Every library faces issues regarding wrong placing of books and, the labour and time involved in manual book management.

Problem Statement

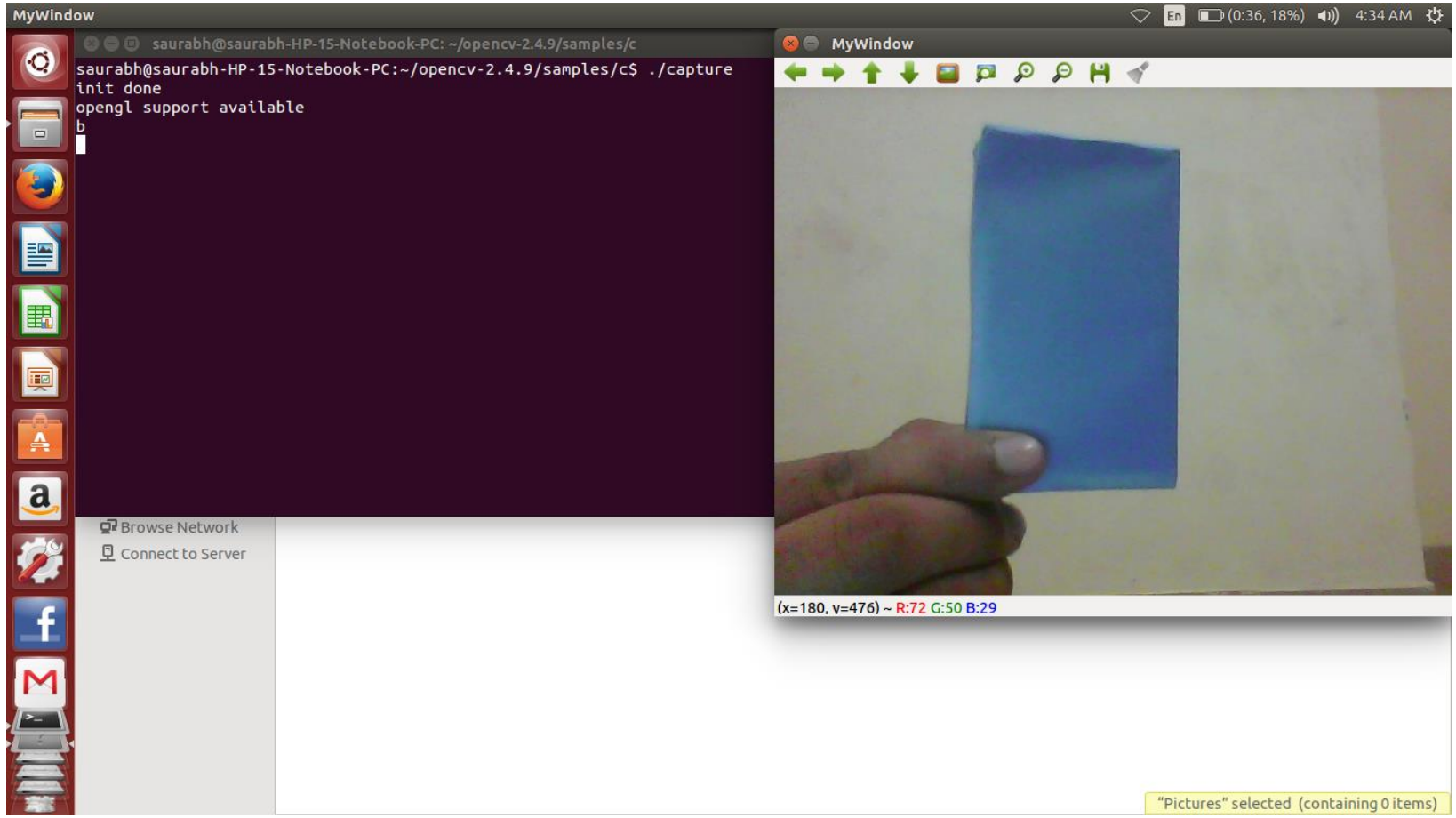
- Development of library helpmate bot with the work of keeping unattended books at their designated location.

Our goals were-

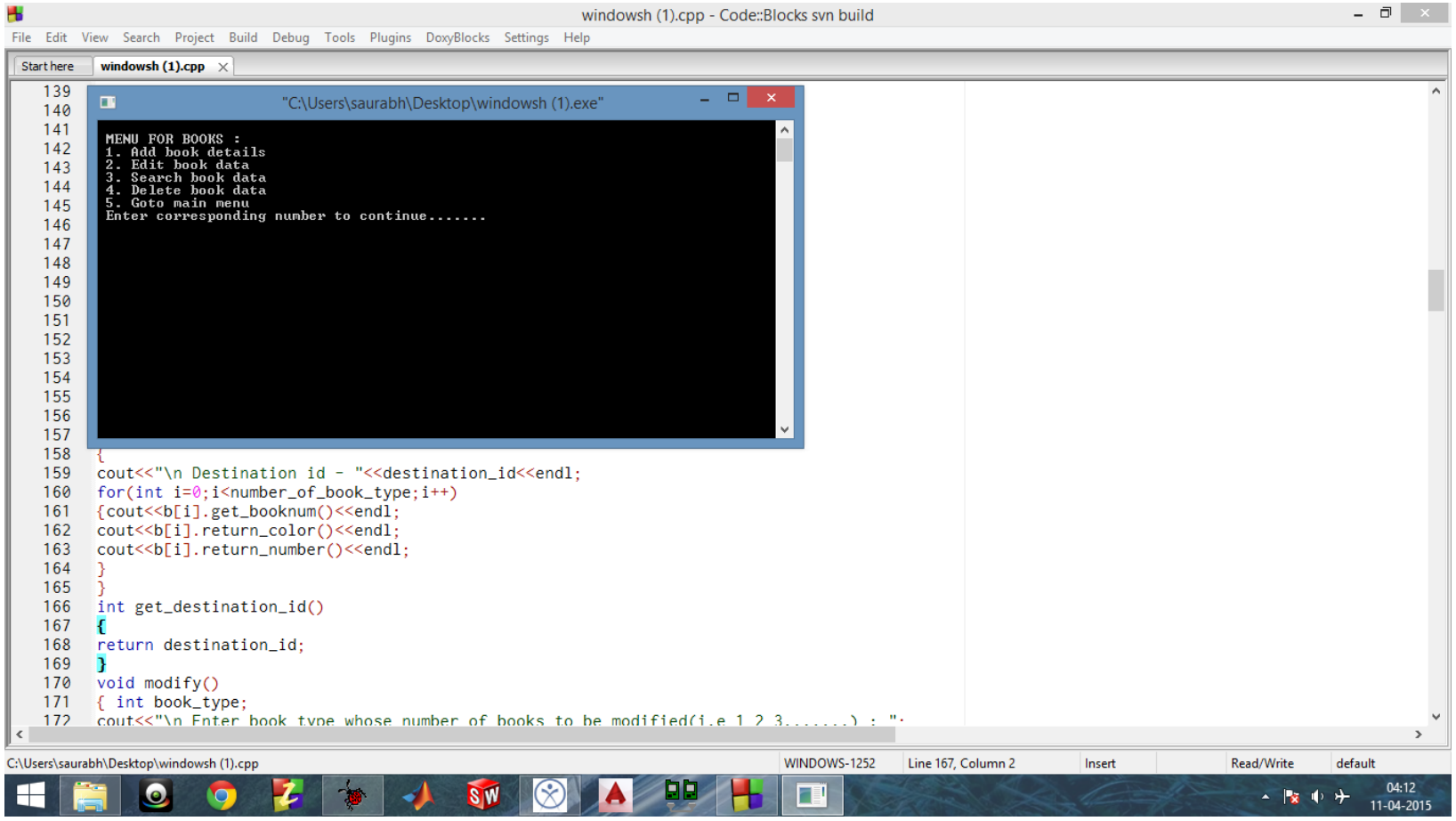
- Develop a library database
- Detect the color of a book using image processing and locate destination
- Communicate with FIRE BIRD V using Xbee
- Use line following for motion of bot
- Detect and circumvent obstacles in the path
- Use gripping mechanism to clasp books


USER INTERFACE PROCESSING
USER
LIBRARY DATABASE
LOGIN
WHITE LINE SENSOR
READING
SHARP SENSORS
READING
ZIGBEE COMMUNICATION
LIBRARY HELPMATE SYSTEM
LINE FOLLOWING
OBSTACLE DETECTION
PATH ALLOCATION
IMAGE PROCESSING
OPEN CV
LIBRARY DATABASE DEVELOPMENT
LAPTOP CAMERA
HAND GRIPPER
CAPTURE IMAGE
OBJECT
USER (LIBRARY STAFF)
Input Processing
MAINTAINENE AND SELF TEST
Output Processing

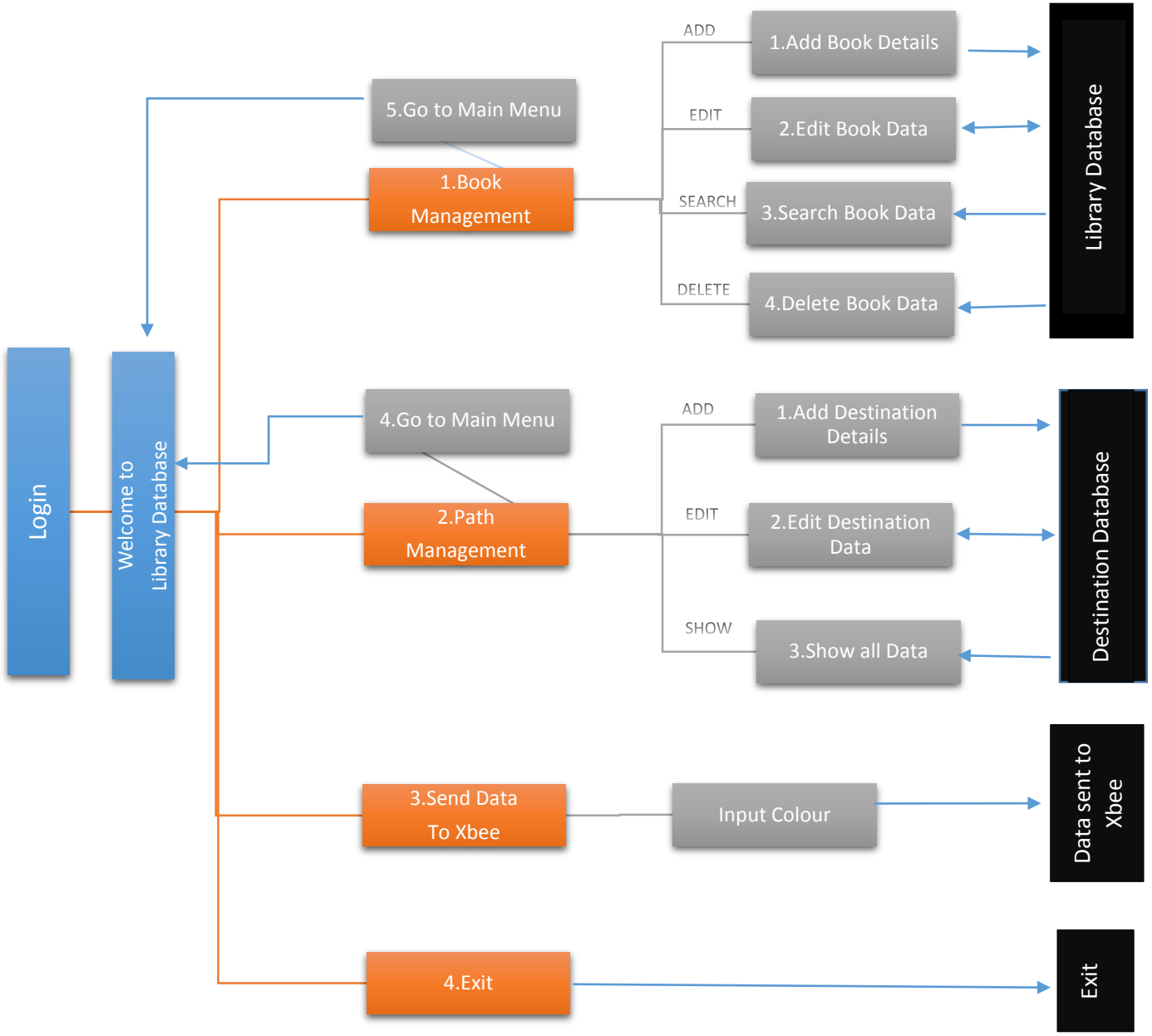
Book Identification



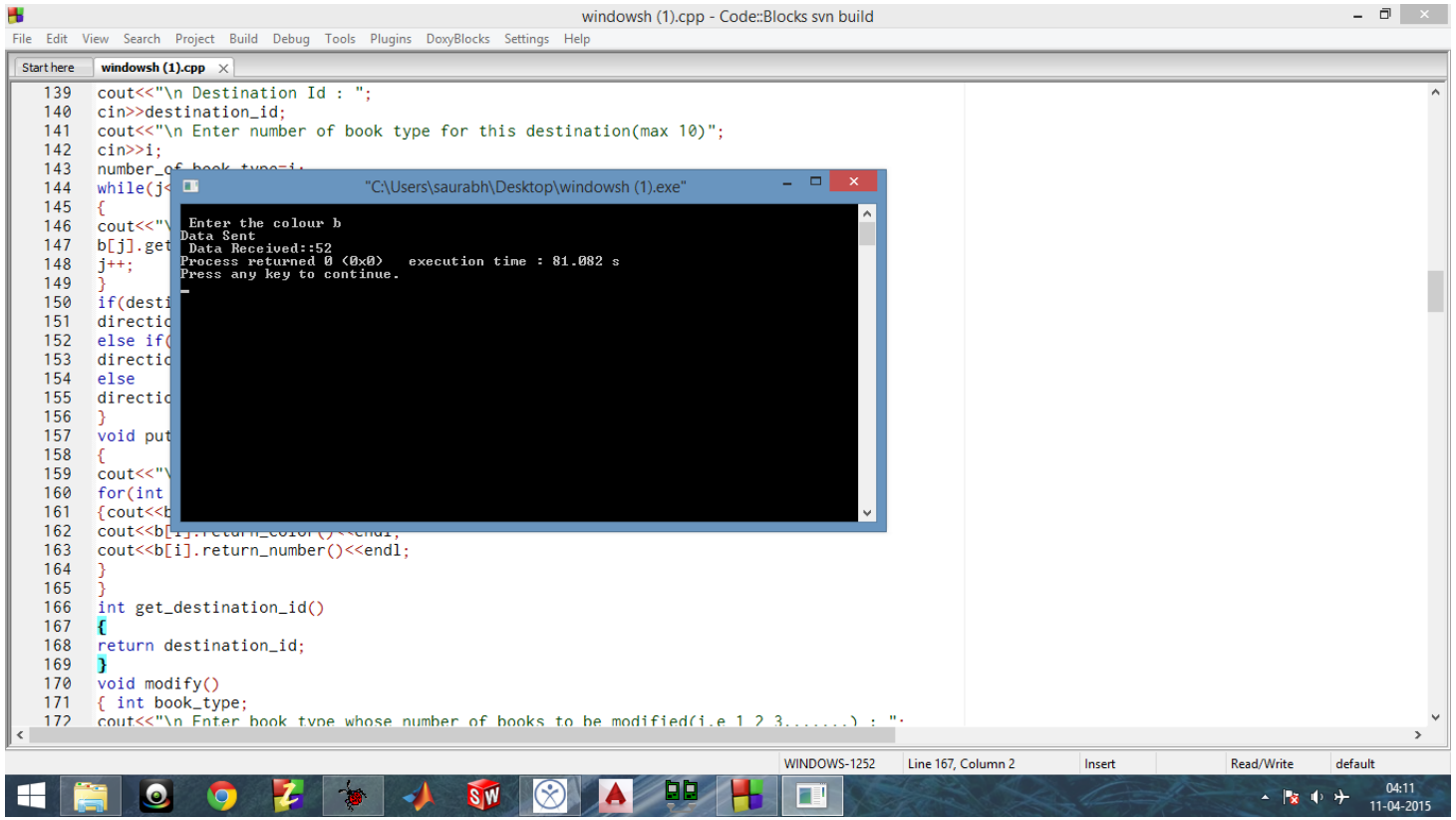
Library Database



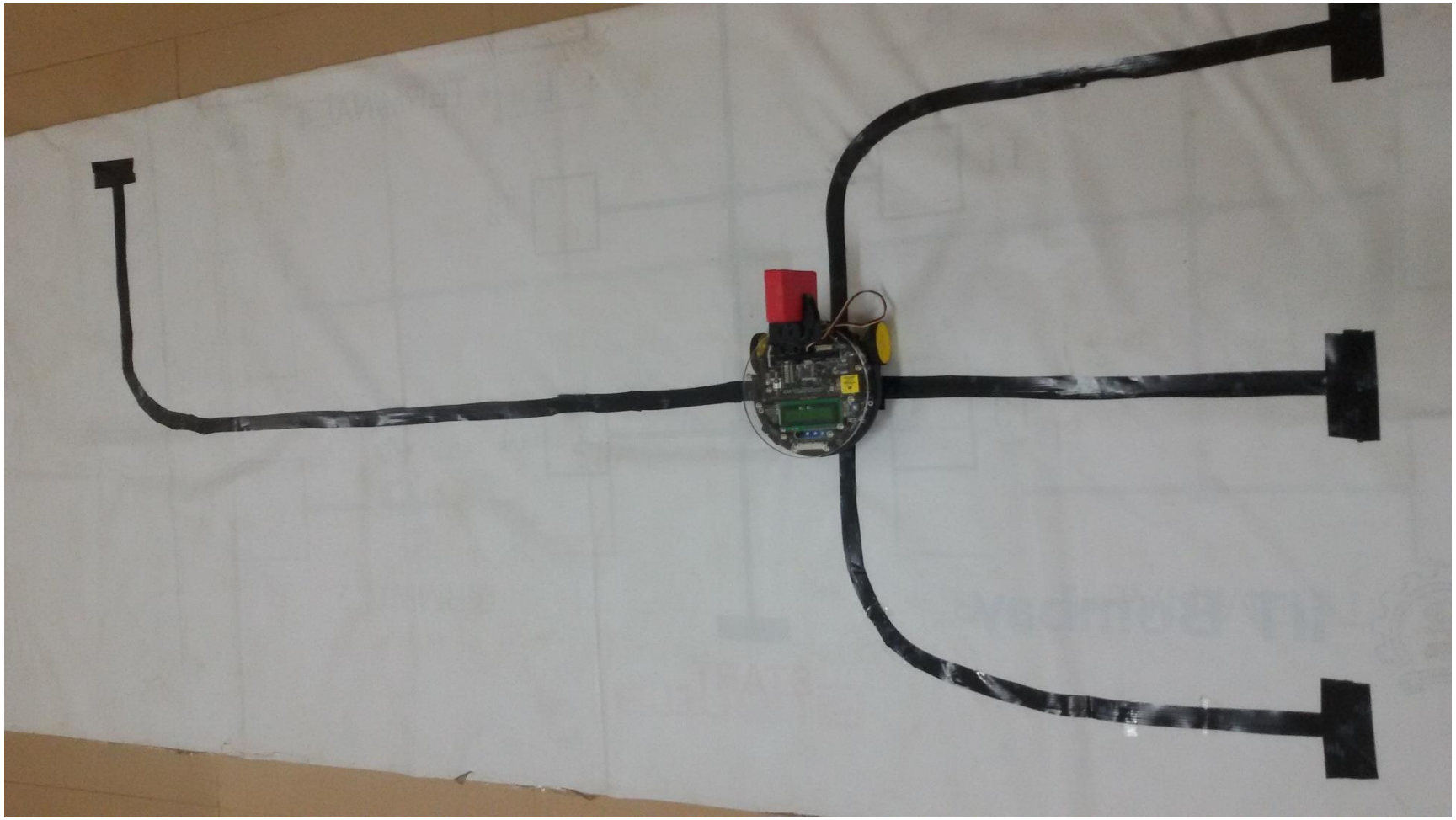
Functionality of Database



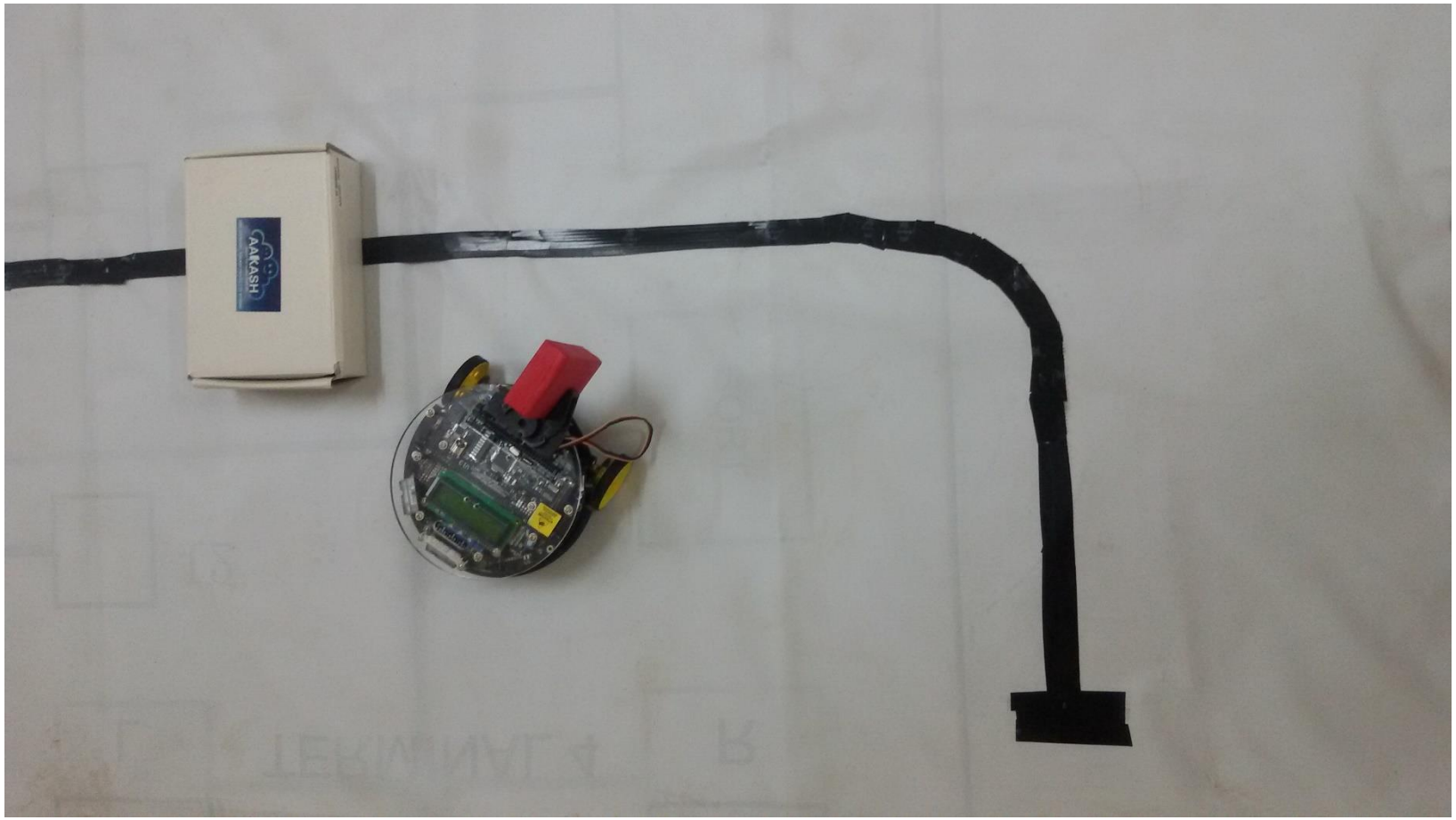
Wireless Communication using XBee



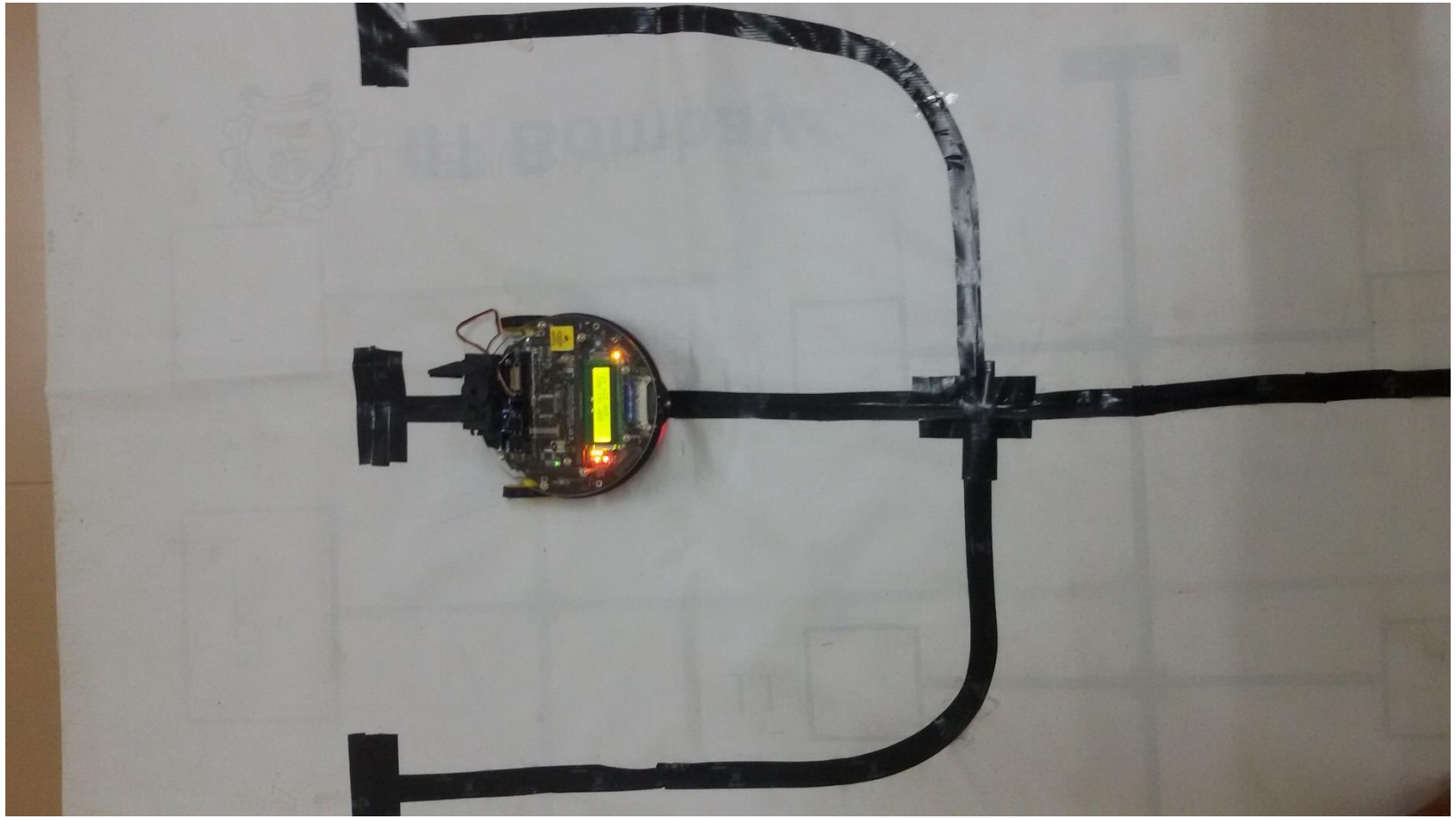
Choosing the designated path

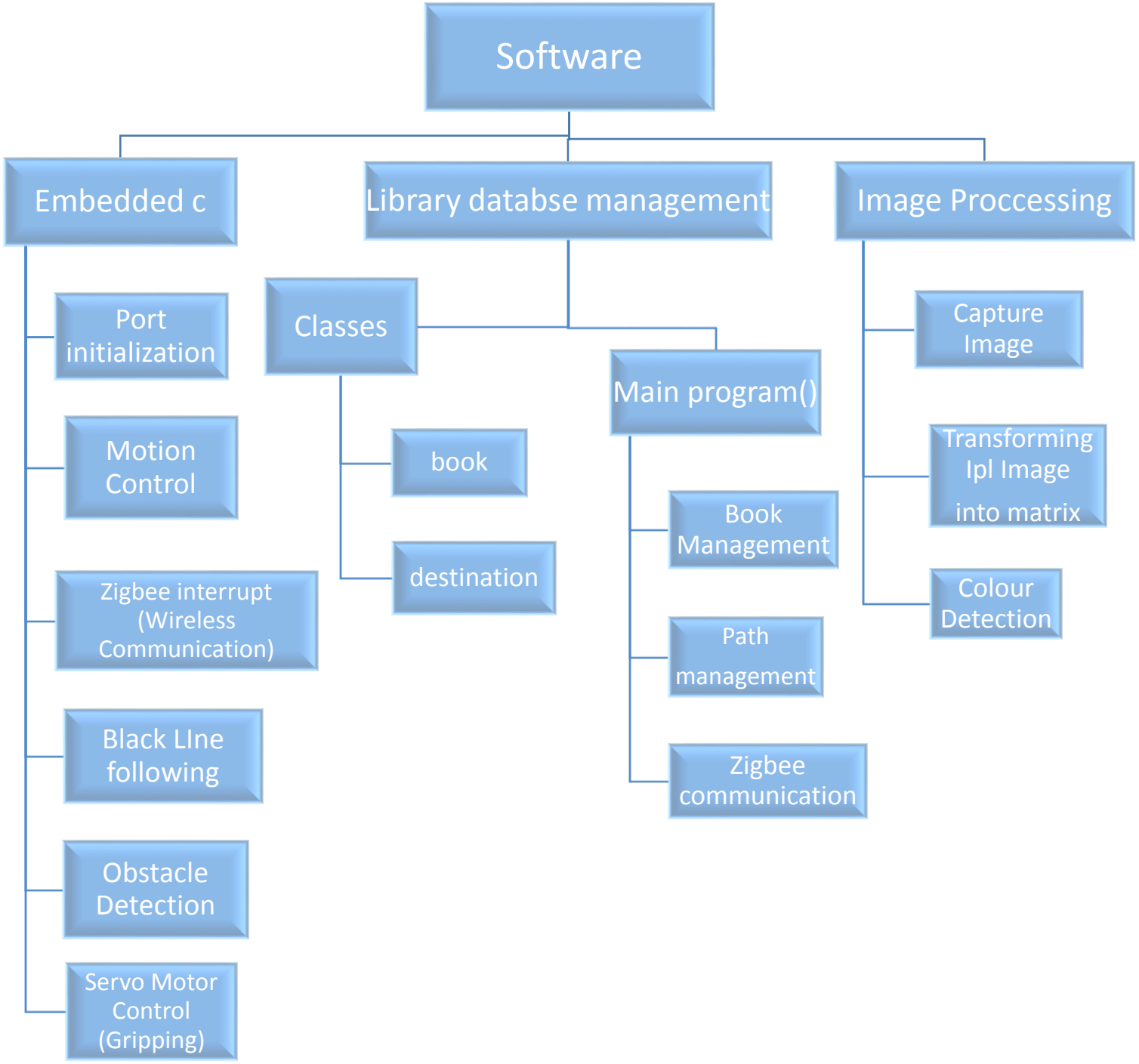


Circumventing the obstacle



Line Following




Software
Embedded c
Library databse management
Image Proccessing
Port initialization
Motion Control
Zigbee interrupt (Wireless Communication)
Black LIne following
Obstacle Detection
Servo Motor Control (Gripping)
Classes
book
destination
Main program()
Book Management
Path management
Zigbee communication
Capture Image
Transforming Ipl Image into matrix
Colour Detection

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 RBG 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.