

Task 1B: Arena Navigation

Welcome to Task 1B!!

The aim of this task is to apply the path planning techniques we learnt in Task 1A on the Firebird V for traversal of the robot through the arena.

You have already printed the flex in Task 0. You will use the robot you have collected from your college to perform this task. Note that the robot must be in working condition so that it can perform the task properly. In this task you will do the following

- Construct a function to reach a Destination Node while Avoiding an Obstacle Node.
- Record a one-shot video of the robot performing the task and upload it on YouTube. For detailed instructions on this, kindly read the *Video_Shooting_Instructions.pdf*
- Upload the YouTube link and the project file of your Embedded C code on the portal as per *Submission Instructions.pdf*

In this document you will find the following sections:

1. Tutorials and Learning Material
2. Arena Configuration and Setup
3. Problem Statement

1. Tutorials and Learning Material

Before you begin to program the Firebird V, it is necessary that you learn about the working of the ATmega2560 Microcontroller and the hardware components on the robot. Learning material can be accessed from the **Resources** tab on the portal. You can download the e-Yantra DVD from there which has helpful tutorials for learning to program the Firebird V.

2. Arena Configuration and Setup

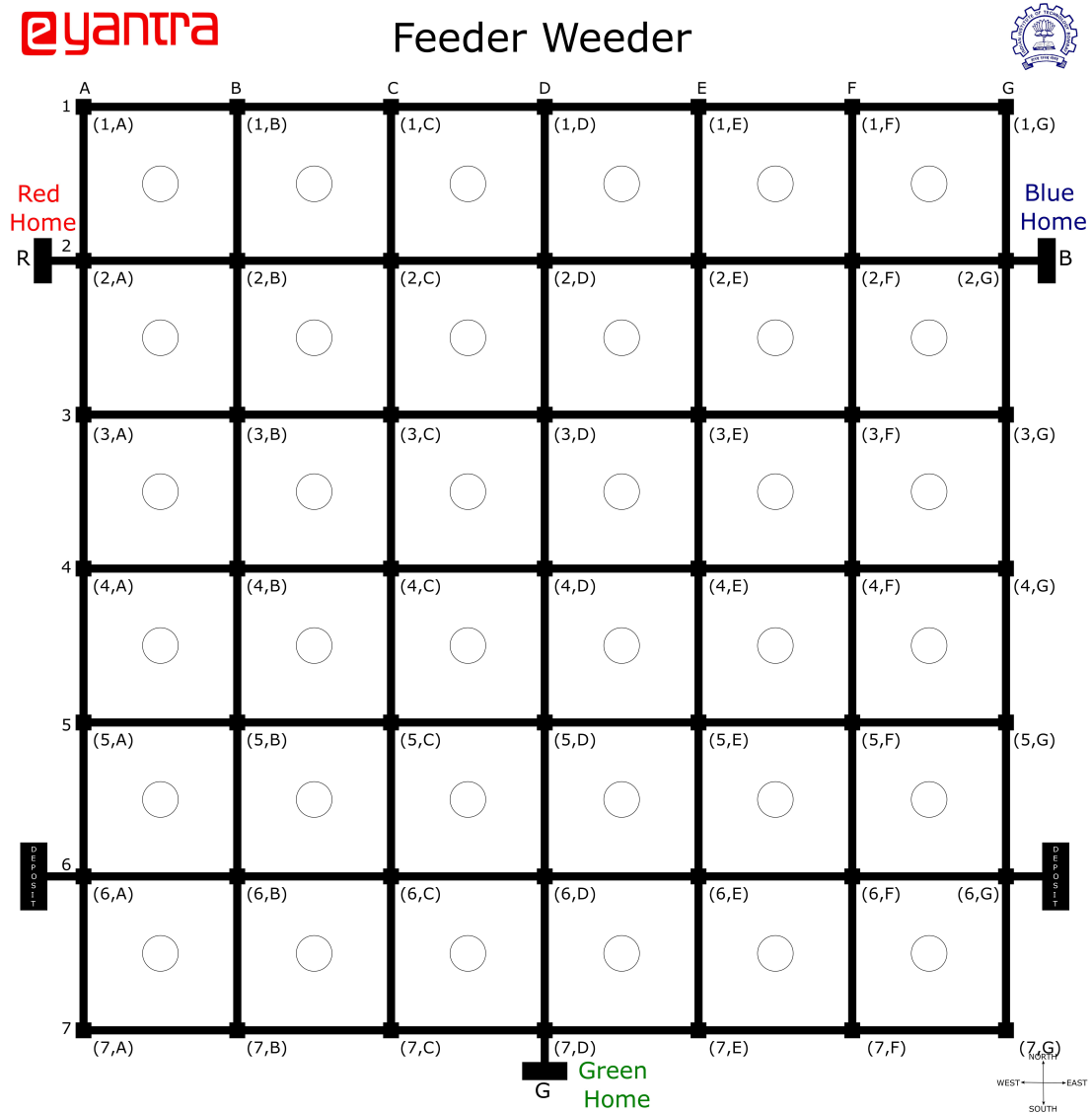


Figure 1: Arena

The arena given in Figure 1 is a simplified abstraction of an agricultural field.

The small black squares on the arena are termed as **Nodes**. There are 49 nodes in the arena which form a grid. The nodes are numbered as ((1,A), (1,B), (2,A) etc) as shown in Figure 1.

Preparing the Obstacles

Teams must prepare 3 Obstacle blocks made out of thermocol whose dimensions are 60 mm x 60 mm x 60 mm as shown in Figure 2.

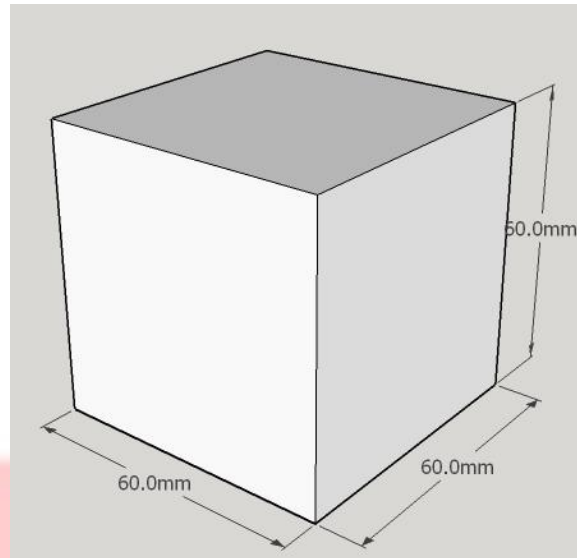


Figure 2: Obstacle Block

Arena Setup

Place the three obstacle blocks at nodes (6,D), (2,D) and (2,C). That will complete the arena setup for Task 1B.

3. Problem Statement

The aim of this task is to implement path planning mechanism on Firebird V to reach a **Destination node** and avoid the **Obstacle node** by constructing a function called `ReachDestinationAvoidingNode()` which takes four arguments, namely co-ordinates of two nodes, **Destination Node** (X_d, Y_d) and **Obstacle Node** (X_n, Y_n). Kindly refer to the Figure 1 for representation of nodes.

Procedure:

Step-1: Open Task1B_Project folder. Open the project named “Task1B.atsln” in Atmel Studio 6.0

Step-2: You will notice some familiar pre-written function declarations .Write program code to complete the functions with the help of function description and inline comments.

Step-3: Write program code in `ReachDestinationAvoidingNode()` function to complete the task1B.

Step-4: Check and debug your code on the robot. Ensure that code performs as expected.

Step-5: Save the project and create a .zip file

Step-6: Shoot a demonstration video of your robot performing this task and upload it on YouTube. Paste the link of your uploaded video on the portal.

Note:

Creating Header File:

To complete this task you may like to create header files to separate functions related to same type of functionality. For example you may like to create a header file for motors to include all the functions related to movement of motors such as forward, backward, left turn, right turn etc. or a header file for including the functions related to ADC conversions. In the Task1B_Project/Task1B folder you'll find two files "buzzer.c" and "buzzer.h" files. "buzzer.c" file include all the initialization of ports and functions and "buzzer.h" defines all the functions and their types. You may create your own header files in similar way. Point to be remembered is that you must use **#include "Your_FileName.c"** command in your header file and **#include "Your_FileName.h"** command in your project file.

Starting Point:

Place your Firebird V on the **Green Home** and switch on your robot.

Obstacle Nodes:

You have to place Obstacle Blocks on the obstacle nodes as mentioned in the code i.e. on the node (6, D), (2, D) and (2, C).

Guidelines for Using Sensors on the Firebird V

You are not allowed to use any distance sensors such as Infrared Proximity Sensors and Sharp Sensors. You are only allowed to use White Line Sensors already present on the Firebird V robot for line following.

Summary of the Task1B:

- a. Construct a function `ReachDestinationAvoidingNode()` to:
 - a. Move from your present node to destination node.
 - b. Avoid an obstacle node to cross-over while moving towards the destination node
- b. Shoot the video of your Firebird demonstrating the task.

After the successful completion of the task, you are also required to upload a video of your accomplished task. Please read carefully the instructions related to shooting of the video.

