Deep Cosmos Navigation System

How to navigate the cosmos faster…

What is DCNS ?

Deep Cosmos Navigation System (DCNS) is an open source positioning system and can navigate in any condition. It uses a radar but not like the ones in aircraft, instead of displaying the data, it uses them internally. My navigation system can be used in rockets which have to travel into deep cosmos and where radio transaction is not possible.

The need for a new system

The Deep Space Network, a collection of antenna arrays in California, Australia, and Spain, is the only navigation tool for space. Everything from student-project satellites to the New Horizons meandering through the Kuiper Belt depends on it to stay oriented. An ultra precise atomic clock on Earth times how long it takes for a signal to get from the network to a spacecraft and back, and navigators use that to determine the craft's position.

The farther rockets go from Earth, however, the less reliable this method becomes. Sure, radio waves travel at light speed, but transmission to deep space still take hours. And the stars can tell you where to go, but they're too distant to tell you where you are.

DCNS : The main concept

We have made a simple robot using ATmega32 and mixing physics, trigonometry and triangulation to solving this question.

We have used Visual Studio for making a software and will let user to select destination and other virtual points.

We have named this project as Deep Cosmos Navigation System (DCNS) .

red —> point1
purple —> base
orange —> destination
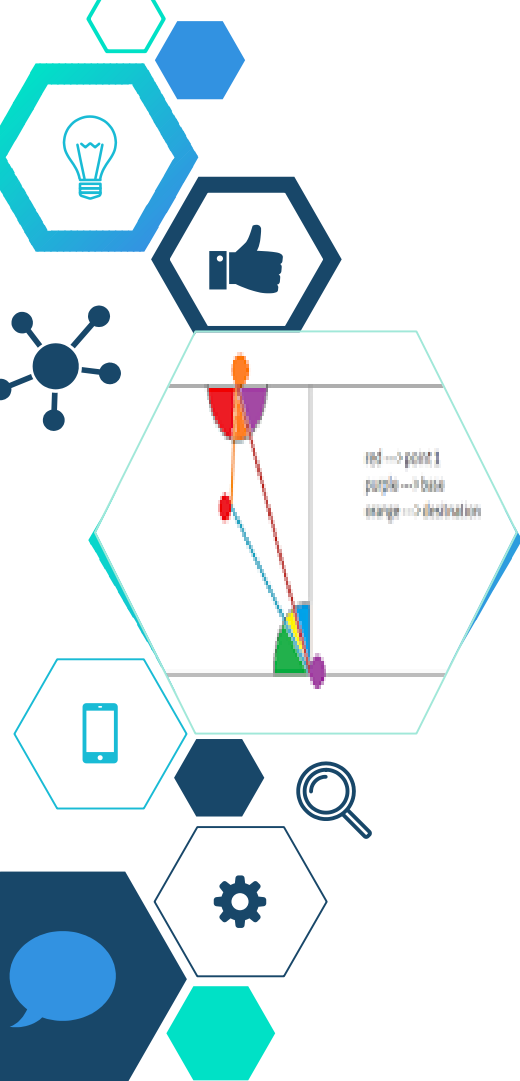
DCNS : Parts Used

We used the following for making the robot:

- Arduino UNO R3 Board (Controller)

- 2N2222 NPN Transistors (DC Motor Driver)

- Optical Encoders (IR for getting rotations)

- DC Motors (To drive the robot)

- Breadboard (For connections)

2N2222

COLLECTOR
3

2
BASE

1

TO-92

1,2,4
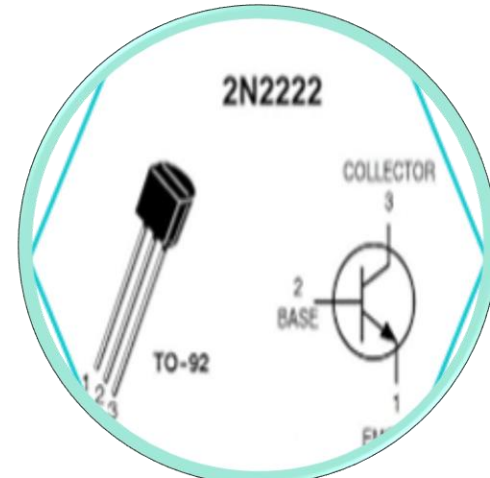
Advantages

✓ It is very easy to use

✓ It is reliable

✓ Instead of a radar system, it uses an analog radar which shortens the load.

✓ Has a vast navigation range (0.2 cm to 9000 light year)

✓ It is accurate than GPS
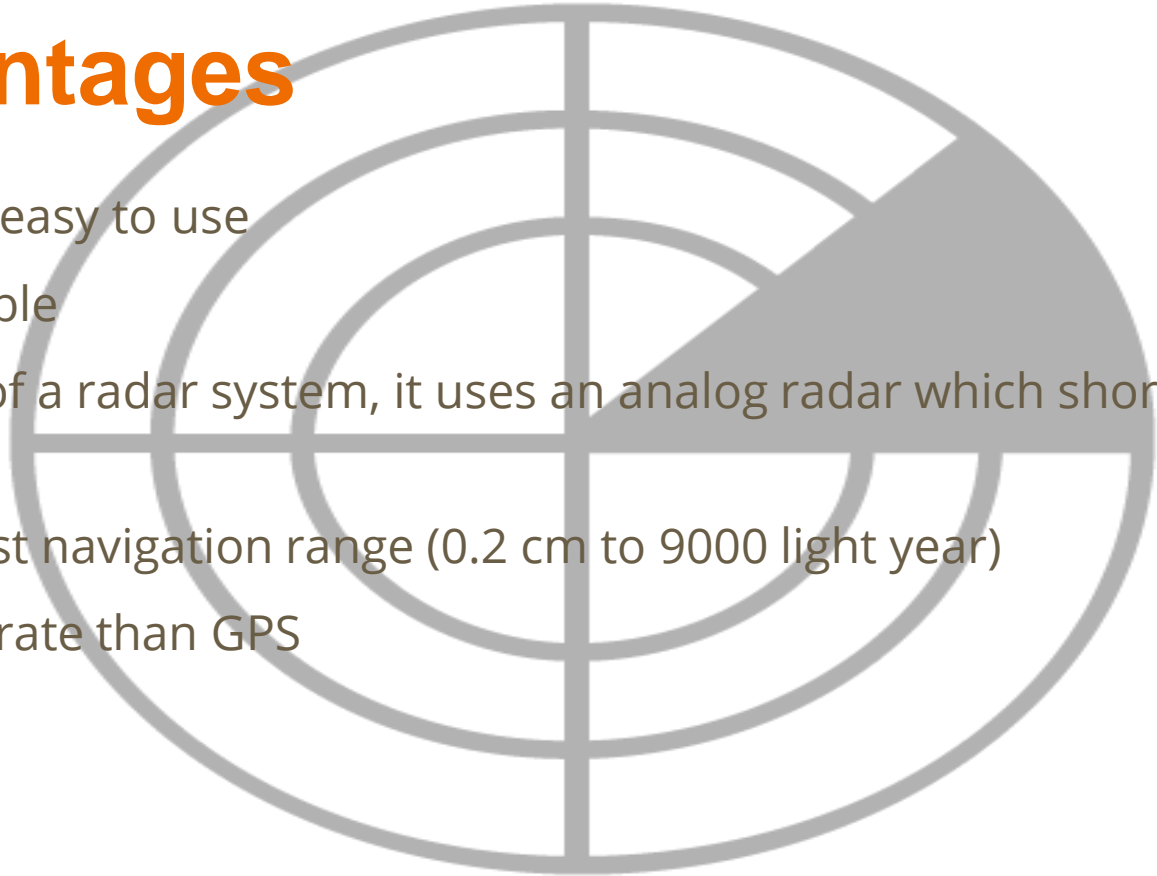
DCNS Navbot

The Navbot is the main component of our navigation system: An engineering level robot. It is made using the Arduino board and uses the values sent by the DCNS System to navigate.

The on-board computer (OBC) will be an ATmega328, as it is very easy to program and helps to implement ideas faster than ever. This gave us access to a wide variety of components.

Let's see its design and functioning

The Design & Making

The Robot was made by using the Arduino Micro controller. The Components were joined all together by using a breadboard, which allows for more development space. All components were bought or prepared separately and then assembled together. The Motors were joined to the Arduino using Diodes and Transistors to prevent back flow and amplify the power sent to the motor. Encoders were fixed to measure distance moved and also balance the wheel movement. The robot was mounted on a self designed *Mechanix* Frame. The final result was the Navbot
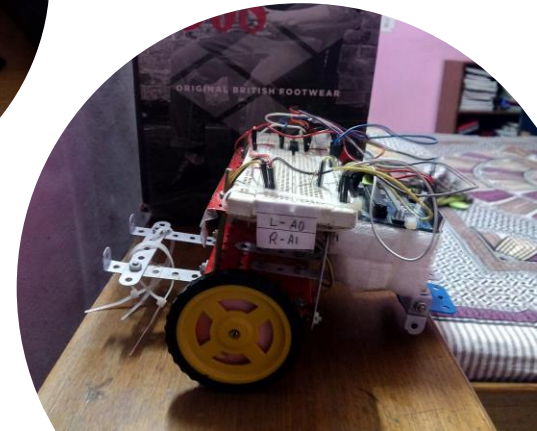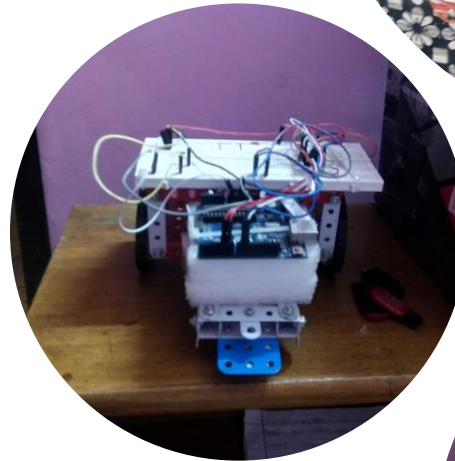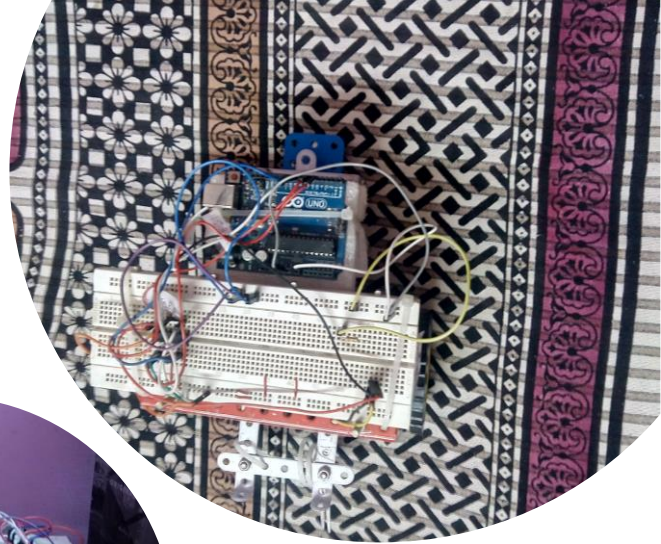
Programming

Here comes the programming IDE and languages.

Arduino : IDE

Arduino has launched it's own IDE which uses various C functions for keywords.It has an extensive collection of headers for any types of projects. It is what makes our project working. With our earlier of C language, we found it easier to program.

Visual Studio

Microsoft Visual Studio is an integrated development environment (IDE) from Microsoft. It is used to develop computer programs for Windows, as well as web sites, web applications and web services.

With our knowledge of VB.NET programming,we were able to develop an app to implement DCNS

Coding and main programs

The DCNS Program Set consisted of three programs(as in order of their use):-

•The Main Positioning System

•The Value Breakup and Writing program

•The Main Navigation Program

In the first part the user will basically select the destination and "virtual points". These points are used to assume the virtual locations of satellites, though there are no real satellites. The module works like GPS by calculating distances from the virtual pts. and then using trigonometric functions to calculate the distance. The second program breaks up these values into integers and writes them in the EEPROM, which serves as a non-volatile memory. The third program is used to read these values, calculate the distance to move and then move the motors accordingly. This is the main navigation

Conclusion

DCNS navigation robot was able to navigate on land and compete with GPS. The navigation was as accurate as GPS and had an error range between 0.02 to 0.9 degrees which is very small to be even noticed!

Once charged the navigation robot can work for 3 days! The navigation system is completely based on mathematics so it is very accurate as it has been proved with paper and pencil.

The navigation system is predefined which means that after the values are put up the robot will navigate automatically and then it does not needs any human interference so it is called 'semi – automatic ' system.

The engineering model of DCNS has proven that navigation can be done at a lower cost and it can become much better than the limited zone of GPS. The navigation with my system is unlimited and can be done anywhere where GPS is lacking behind.

Thanks!