

# Design and Development of Underground Digging Explosive Robot for Military Application

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**Abstract**--The military forces always tried to use new gadgets and weapons for reducing the risk of their casualties and to defeat their enemies. Today's modern military forces are using different kinds of robots for different applications. This model analyzes requirements and presents a robot design capable of tracking autonomously underground. The robot is a robust powered by electric DC motors and able to withstand the harsh environment. We design and fabricate underground explorer robot that use peristaltic crawling of an earthworm for a propulsion part and an earth auger for an excavation. In the process of excavation, the earth auger bit excavates soil, and its spiral carries excavated soil to the rear.

**Keywords:** Auger, casing, Explosive, Controlling, Tracking

## I. INTRODUCTION

Border security and soldier safety is important concern of defense ministry. Modern technologies has been used in defense to improve the work skills and method of doing work. Also the drone is an example of technology which can be use for multipurpose applications.

The work performed in this paper explain the concept of underground digging explosive robot which can drill in smooth sand through underground. the robot is capable for travelling up to required distance by digging action. the movement of the robot achieve with dc planetary geared motor of 240N.mm torque. Rf wireless controller circuit is used to control the motor rotation. the application of the robot is to drill with decided path and reach to enemy location to destroy their camp. The variables that affect digging are examined, as well as the design decisions made in order to get forward motion for digging.

## II. METHODOLOGY

### A. Problem definition

On the border area due to ceasefire violation from neighbor country our soldier are died continuously, and on mountains the duty of soldier is very hard. To provide security in contact with the ground and onboard human presence.

### B. Key points

1. To improve soldier safety
2. Reduced human intervention to plant explosive

### C. Proposed Methodology

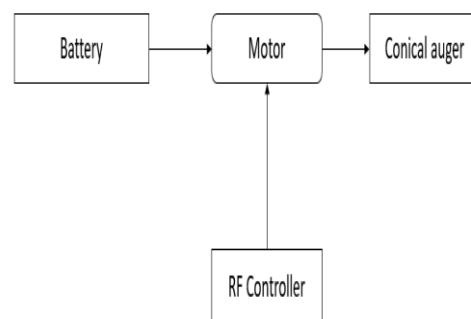


Fig1. Block Diagram proposed methodology

#### D. Drilling Mechanism

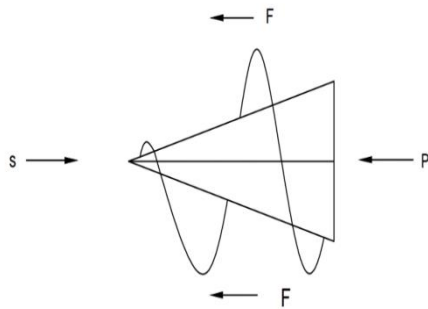


Fig2. Force Acting On Conical Auger.

Fig 2. shows conical auger which is a drilling device or drill bit that usually includes a rotating helical screw blade called as a 'flight' to act as a screw conveyor to remove drill out material. The rotation of a blade causes the material to move out of the hole being drilled. Soil will flow from flights when it moves in soil. Material used for conical auger is SS-304.

Table1. Dimensions of auger blades

D (mm)	ID (mm)	OD (mm)
170	80	140
140	65	105
105	50	80
80	30	47
47	20	20

Table 1. describes the dimension of helical flights that is gradually decreasing in its width. Starting diameter of first blade is 170mm, as it moves on conical shape it's gets decrease up to 140 mm to weld its side on another blade. Then this blade is weld on 82 periphery diameter of cone. Further flights are welded as per the table.

#### E. Controlling Device:

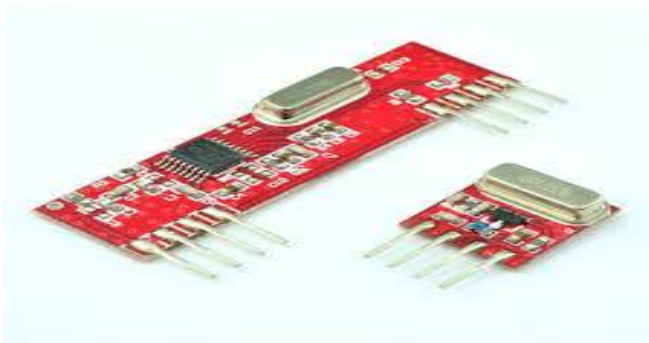


Fig 3. Control Unit.

For controlling the motion and speed of motor RF circuit is used. RF communication incorporate a transmitter and a receiver. They are of various types and ranges. Which can transmit up to 500 feet. RF modules typically fabricated using RF COSMOS technology.

#### F. Motor



Fig 4. DC Motor.

12 volts DC motor has been used with sufficient torque to overcome soil resistance to raise the load. It is a bidirectional motor which can spin forward or backward. The speed of motor is 50 rpm.

#### G. Battery



Fig 5. Battery.

Lithium-polymer battery is compact in size. it has more charging cycles than Lead acid batteries. 12 volt battery has been used to give power to motor and RF circuit.

### III. RESULTS AND DISCUSSION

From the rotary torque comparison results the calculation rotary torque obtained from the theoretical model also coincides well with the test results. Under the same rotary speed, the rotary torque increases with the penetration velocity significantly. When the penetration velocity is 120mm/min, the rotary torque reaches 34Nm, almost the maximum digging load that the test platform can sustain.

### IV. CONCLUSION

The research carried out on the machines, equipment use in military application, in these designed a small underground digging explosive robot which can travel through underground to destroy enemies place. It verified the potential of our design model. The future work will be to track the robot by GPS tracking and also avoid obstacles in path. it will be work in different sand other than smooth sand.

### V. REFERENCES

- 1) Olanrewaju T. O., Jeremiah I. M., "Design and fabrication of a screw conveyor", vol.19, pp :156-162, Oct 17 (pg no 161)
- 2) Dr. B.C. Punmia "Soil Mechanics and Foundation" (pg no 12).
- 3) Duan Longchena, Tan Songchengb, c, Gao Huia "Study on Auger Drilling Technology for Sampling Drilling", vol.73, pp 212-217, MAY 2014 (pg no 215).