**Project Aim**

Design and develop a prototype of a robot that can travel semi-autonomously to a given target using vision.

**Use Case**

- The robot is placed at a safe distance (20m) from a potential bomb threat area.
- After selecting the suspected target location from the camera’s view, the soldier instructs the robot to move to auto-mode.
- The robot moves autonomously towards the target, navigating around obstacles in its path.
- If it loses track of the target, it tries to re-identify the destination by itself.
- Notifies the operator if a timeout is reached, after being lost.
- Notifies the operator on reaching the destination for operating the onboard manipulator.

**Functional Architecture**

- Target Tracker - Open TLD
  - Tracking
  - Learning
  - Detection
  - Scans for object in every frame.
  - Detects pre-seen appearance. Reinitializes tracking.

- Obstacle Avoidance
  - Robot encounters obstacle.
  - Maintains bounding box to side without obstacle.
  - Tracks object maintaining the window.
  - Once clear of the obstacle, bounding box returned to the centre of frame.

- User Interface
  - User Interface State Machine Diagram
  - Tracks the object.
  - Target Reached Estimate

- CAD Modeling
- Chassis & Suspension
- Installing Sensors
- Electrical and Electronics

**System Design**

**Performance**

**Main Requirements**

- Remote Selection of Destination
- Robust Tracking of Target
- Manual Intervention
- Live Video Feed over 40m range
- Climb Slope of 12°
- Single Obstacle Avoidance 90%
- Multiple Obstacle Avoidance 2/4
- Weight 6.7kg
- Travel Time (Without Obstacle) 58 s
- Travel Time (With Obstacle) 2 min

**Lessons learned and Future Work**

**Lessons learned**

- Test concepts early and extensively
- Integration takes time
- Lead time consideration
- Design choices should be made with priority to testing.
- ROS – Excellent Infrastructure

**Future Work**

- Improve Sensor/Controller
- Further enhance obstacle avoidance ability
- Use smaller form factor PCs.
- Arm to perform EOD operations.

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