Object Tracking for Safety

Team SafeBots: Preeti Kannapan, Malvika Shetty, Saptadeep Debnath

I. Project Description

The aim of our project is to implement object tracking in videos using bounded boxes for safety applications. With more and more autonomous robots and vehicles being deployed in the world, it is becoming increasingly important to ensure the safety of everyone in the robot's environment. There are many contexts in which this is applicable – i) human-robot interactions e.g. collaborative robots ii) robot-robot interactions e.g. industrial robots iii) robot-object interactions e.g. in manipulation or obstacle avoidance tasks. Specifically, we would like to use object tracking to detect and draw conclusions about the distance of the moving object from the camera, and additionally issue a warning based on the proximity of the object to the camera. Such a warning would be useful for a robot, vehicle, or even human, to react appropriately when the camera is mounted on them. This will be done with a depth estimator method that makes use of the variation in scale of the bounding box with depth of the object. Therefore, we propose to implement object tracking as well as a proximity warning system for safety purposes.

II. Demonstration

The video submission will include (but will not be limited to);

- the methodology used to implement object detection and tracking,
- a comparative study of the implemented method with other state-of-the-art techniques,
- the methodology used to implement the proximity warning system with depth estimation, and
- a live visualization of the integrated system performing object tracking and proximity warning on a video.

III. Impact on Society

There are a variety of ways in which this project could positively impact the society. With the ongoing pandemic this year, there has been a large focus on contact-less service robots in hospitals, restaurants etc. Such robots would be required to interact with humans and it is imperative that they do so in a safe manner. To do this they would have to track moving objects around them, both for obstacle and people avoidance as well as for manipulation of objects that may need to be taken or given to humans - for example, a tray of food. Apart from this there are a number of conventional applications where object tracking for safety is required. In industrial settings, active or mobile robots must operate safely with industry workers as well as with each other. Autonomous vehicles must track pedestrians, traffic signals, stop signs and other moving vehicles to drive safely. High precision and accuracy are of great importance in these applications since such robots/vehicles work in highly human-interactive environments.

References

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