A Study Comparing Faster R-CNN, YOLO, and SSD Object Detection Algorithms on the HIDS System

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Abstract. It takes time, money, and effort to keep a watch on your home. Numerous catastrophes, such as burglaries and vandalism, had a place in homes when the owners were negligent or absent. While employing staff is not thought to be a cost-effective alternative, some residential areas employ guards to watch over their homes. A mobile application-based Internet of Things (IoT) system called Home Intruder Detection System (HIDS) assists homeowners in keeping an eye on their houses by remotely alerting users to any potential dangers. The main goals of HIDS are to develop a trustworthy home security system using IoT, to apply the object detection algorithm to identify human presence, and to develop an intelligent mobile application that will allow users to monitor their homes from anywhere in the world and receive alerts if any threats are found. To identify intruders using a camera attached to the system, HIDS is used tested and compared the Region-based Convolution Neural Network (R-CNN), Single-Shot Multibox Detection (SSD) and You Only Look Once (YOLO) detection object detection method in the NVIDIA Jetson Nano. The system is capable of delivering detection video to the server and capturing video at frame rate (FPS) of 44.25 for YOLO, 37.81 for SSD and 27.21 for faster R-CNN respectively. Faster R-CNN, SSD, and YOLO algorithms' average precisions will be 94.08%, 89.75%, and 81.92% respectively. HIDS achieves its objectives by successfully recognizing people and remotely informing detection users via mobile applications.

Keywords— R-CNN, SSD, YOLO, FPS, NVIDIA, HIDS

INTRODUCTION

When owners are oblivious, careless, or away from the house, many disasters like robbery and vandalism take place. While some residential neighborhoods' pay guards to keep an eye on their residents' homes, hiring laborers is not thought to be a cost-effective alternative. Home intrusion detection systems are now available thanks to the Internet of Things (IoT), which uses sensors like cameras to find intruders. However, these systems might seem less useful in the absence of real-time data. Instead of only capturing video of the incident, live-data notifies homeowners of an intruder. For this job, there are numerous comparable systems on the market. Multiple home monitoring plans, including live video monitoring and home automation combined with a mobile application, are available through an advanced home security system created by ADT Security [1]. The product's Internet of Things (IoT) implementation and smart phone application, which enable consumers to monitor their houses from any location, are its strong points. The system's flaw is that the plans available are highly pricey and do not use intelligent human detection to discover anomalies in their system. A security system from GTC with a Malaysian foundation that provides excellent discounts on security solutions is another comparable system [2]. The system