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Classroom Automation Using YOLO Algorithm

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ABSTRACT
In classrooms we have electrical devices left switched on, though students were not present in the room and this is a common occurrence in all our daily lives too. So, this becomes of utmost importance that this non-renewable form of energy being wasted is conserved as much as possible. So, in this project we use machine learning to automate the lights and fans in classrooms. In homes, classrooms and offices have electrical devices left switched on, though people were not present in the room and this is a common occurrence in all our daily lives too. So, this becomes of utmost importance that this non-renewable form of energy being wasted is conserved as much as possible. Many automation techniques are already proposed and implemented as well, but many among them are not completely related to electricity conservation and others are not very efficient. So, the proposed energy saving classroom automation system could be used to detect the presence of a person/student inside the classroom and automatically adjust the state of electrical appliances to reduce power consumption. This is done by implementing person detection using CNN (Convolutional Neural Network) with YOLO algorithm.
Keywords: Object detection, Energy Generation, Coco Dataset, YOLO Algorithm, Non-Maximal Suppression, Image classification.

INTRODUCTION
The monitoring and forecasting of weather conditions are essential for a variety of applications, including aviation, agriculture, and disaster management. In this project report, we will present the design and implementation of a weather monitoring and forecasting system. The system will be capable of collecting data from various sensors, processing it, and providing accurate weather forecasts. The primary objectives of the project are: To design a weather monitoring system that can collect real-time weather data from various sensors. To develop an algorithm that can process the collected data and provide accurate weather forecasts. To build a user-friendly interface that displays real-time weather data and forecasts. The weather monitoring system will consist of various sensors, including temperature sensors, humidity sensors, wind sensors, and rain gauges. These sensors will be placed in different locations to collect weather data. The collected data will be transmitted to a central server, where it will be processed using an algorithm that considers various weather parameters. The algorithm will use machine learning techniques to analyze the data and predict weather conditions accurately. The system's user interface will be designed using a web-based application that displays real time weather data and forecasts. The application will be interactive, allowing users to input their location and view weather forecasts specific to their area. The weather monitoring and forecasting system will provide accurate weather forecasts, enabling users to plan their activities accordingly. The system will be capable of collecting data from various sensors and processing it using an algorithm that considers various weather parameters. the weather monitoring and forecasting system is a valuable tool for various applications, including aviation, agriculture, and disaster management. The system's ability to collect real-time data from various sensors and provide accurate weather forecasts will assist users in planning their activities and mitigating the effects of adverse weather conditions. From using the design thinking process, we find the solutions for problem quickly and Better than others.

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EXISTING METHODOLOGY

Michal Maj, Appsilon DataScience.qq, Object Detection and Image Classification with YOLO Some time ago, I was intrigued by the exciting world of convolutional neural networks. How can we use them to classify images? (If this sounds interesting, you should also read this post.) Aside from simple image classification, computer vision is full of fascinating problems, with object detection being one of the most intriguing. It is most commonly associated with self-driving cars, in which systems combine computer vision, LIDAR, and other technologies to create a multidimensional representation of the road and all of its participants. Object detection, on the other hand, is used in video surveillance, particularly in crowd monitoring to prevent terrorist attacks, count people for general statistics, and analyze customer experience with walking paths within shopping malls. Ok So, exactly what is object detection? To begin answering that question, consider image classification. In this task, we have an image that we want to categorize (car, dog, cat, human, etc.), so we basically want to answer the question "What is in this picture?" It's worth noting that each image has only one category assigned to it. After completing this task, we attempt to locate our object in the image, so our question becomes "What is it and where is it?" This is known as object localization. So far, so good, but in practise, we will be looking for multiple objects in a single image rather than just one. As an example, Consider a self-driving car that must locate other cars, traffic lights, signs, and humans in real-time video streams and then take appropriate action based on this information. It's an excellent demonstration of object detection. We are interested in finding all objects in an image and drawing so-called bounding boxes around them in object detection tasks. In some cases, we may want to find the exact boundaries of our objects using a process known as instance segmentation. YOLO Object Detection and Recognition: Find and Recognize URL(s) in an Image Scene Ajala John, 2021. The world of the twenty-first century is rapidly moving towards automation. This surge appears to have no end in sight in the near future. Image recognition is at the forefront of this charge, which aims to revolutionise the average man's way of life. If robotics can be compared to the process of creation, If image processing is the development of a body for computers to live in, then image processing is the development of the part of its brain that deals with image identification and recognition. To accomplish this task, we created an object detection algorithm called YOLO, which stands for "You Only Look Once. "Our algorithm was trained on 50,000 images, evaluated on 10,000 images, and used a 21 x 21 grid. We also created a text generator that generates text and URLs in an image at random. A record of useful information about the location of the URLs in the image is also kept, and this information is later passed to the YOLO algorithm for training. We discovered a significant difference in the accuracy of URL detection when using OCR software versus our YOLO algorithm at the end of this project. However, when combined with OCR software, our algorithm would be best used to specify the region of interest before converting to texts, which greatly improves accuracy.

PROPOSED METHODOLOGY

A.Problem Definition:

In this current living world, there is a high demand for electricity and also electricity is being wasted. The demand for electricity increases as well as the population increases. Major amount of electricity is being generated from fossil fuels than that of renewable energy. The share of Fossil energy is around 62 to 68 percentage whereas the share of Renewable energy is around 20 to 28 percentage only which is comparatively less.

Overview Of the Project:

YOLO (You Only Look Once) real-time object detection algorithm, which is one of the most effective object detection algorithms that also encompasses many of the most innovative ideas coming out of the computer vision research community. Object detection is a critical capability of autonomous vehicle technology. It’s an area of computer vision that’s exploding and working so much better than just a few years ago. YOLO came on the computer vision scene with the seminal 2015 paper by Joseph Redmon et al. “You Only Look Once: Unified, Real-Time Object Detection,” and immediately got a lot of attention by fellow computer vision researchers. There is also a TED talk by

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University of Washington researcher Redmon in 2017 highlighting the state of the art in computer vision. Object detection is one of the classical problems in computer vision where you work to recognize what and where specifically what objects are inside a given image and also where they are in the image. The problem of object detection is more complex than classification, which also can recognize objects but doesn't indicate where the object is located in the image. In addition, classification doesn't work on images containing more than one object. You Only Look Once algorithm is popular because it achieves high accuracy while also being able to run in real-time. The algorithm "only looks once" at the image in the sense that it requires only one forward propagation pass through the neural network to make predictions. After non-max suppression (which makes sure the object detection algorithm only detects each object once), it then outputs recognized objects together with the bounding boxes. With You Only Look Once algorithm, a single CNN simultaneously predicts multiple bounding boxes and class probabilities for those boxes. YOLO trains on full images and directly optimizes detection performance. • YOLO is extremely fast. • YOLO sees the entire image during training and test time so it implicitly encodes contextual information about classes as well as their appearance. • YOLO learns generalizable representations of objects so that when trained on natural images and tested on artwork, the algorithm outperforms other top detection methods.

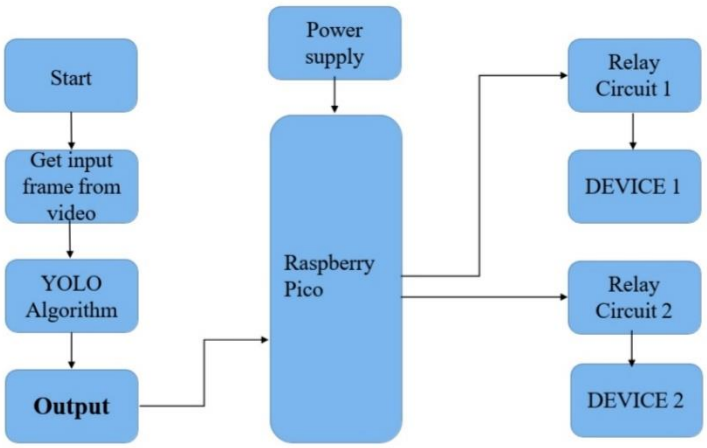

Figure 1. Data Flow Diagram

B. Module Description:

This project consist of four modules and those modules are Listed below

- Getting input frame from Camera
- Input image into grids
- Image classification and localization
- Non-Maximal Suppression

GETTING INPUT FRAME FROM CAMERA:

We get input frame image from a video from the camera using the computer vision packages. Basically, video frames are sequences of images extracted from a video from the camera. The frame is a single image in a sequence of pictures(video).

INPUT IMAGE INTO GRIDS:

The YOLO algorithm works by dividing the image into N grids, each having an equal dimensional region of SxS. Each of these N grids is responsible for the detection and localization of the object it contains. Correspondingly, these grids predict object being present in the cell. This process greatly lowers the computation as detection is handled by cells from the image.

IMAGE CLASSIFICATION AND LOCALIZATION:

Image classification involves predicting the class of one object in an image. Object localization refers to identifying the location of one or more objects in an image and drawing abounding box around

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their extent. Object detection combines these two tasks and localizes and classifies one or more objects in an image.

NON-MAXIMAL SUPPRESSION:

In Non-Maximal Suppression, YOLO suppresses all bounding boxes that have lower probability scores. YOLO achieves this by first looking at the probability scores associated with each decision and taking the largest one. Following this, it suppresses the bounding boxes having the largest Intersection over Union with the current high probability bounding box. This step is repeated till the final bounding boxes are obtained.

CONCLUSION

CNN architecture using yolo algorithm have been implemented and found that this could identify people of any image. This model detects an object if its confidence value is greater than or equal to thirty percent and conclude if it belongs to person class of coco dataset. In future we are trying to enhance this project by integrating it with the piezoelectric energy generation system which was already done by our team. This makes it a completely automated system that generates energy on its own and make the fan and light to on and off according to the presence of people.

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