Project Synopsis
on
Primary School Monitoring System

Submitted as a part of course curriculum for

Bachelor of Technology
in
Computer Science

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2022-2023

DECLARATION

We hereby declare that this submission is our work and that, to the best of our knowledge and belief, it contains no material previously published or written by another person nor material which to a substantial extent has been accepted for the award of any other degree or diploma of the university or other institute of higher learning, except where due acknowledgement has been made in the text.

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CERTIFICATE

This is to certify that Project Report entitled "**Primary School Monitoring System**" which is submitted by **Shivendu Mishra, Yashasvi Baliyan, Shiva Agrahari** in partial fulfilment of the requirement for the award of degree B. Tech. in Department of Computer Science of Dr A.P.J. Abdul Kalam Technical University, Lucknow is a record of the candidates own work carried out by them under my supervision. The matter embodied in this report is original and has not been submitted for the award of any other degree.

Date : 14/11/2022

Supervisor Signature

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ACKNOWLEDGEMENT

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Last but not the least, we acknowledge our friends for their contribution to the completion of the project.

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ABSTRACT

Mid-day meal is wholesome freshly-cooked food lunch served to children in every government and government-aided schools, the main aim of serving the mid-day meal is to avoid classroom hunger, increase school enrolment, increase school attendance, address malnutrition and much more. Apart from its ambitious aim some shortcomings in this scheme made it a huge failure. One of the main cause of failure is Corruption in the enrolment of the students, the teachers or faculty that are responsible for these services sometimes make a fake record of the student and show their attendance records to the higher authorities to claim the financial benefits for the mid-day meal due to which the students actually attend the classes are lesser than what is shown to the government. So to overcome this problem Machine Learning technologies can be used, the CCTV cameras in the classroom are synchronized with the system to capture snapshots at random time according to the timetable of the class, and with the help of Object Detection technology, the count of persons can be taken and will matched with the records that are provided by the respective faculty. This method will help the higher authorities to monitor the classroom automatically and can detect any Mal-practices or Corruption if detected.

INTRODUCTION

We are working on a project primarily for Government primary schools, we are basically building a monitoring system for estimating the count of students present during the mid-day mealtime and during the lecture time. We are evaluating this count as it has been observed that the count of students during mid-day mealtime is not identical to the count of students during lecture time, there is a discrepancy here so, our monitoring system will count the presence of students randomly, and frequently various times so that it can estimate accurately up to 85% or more so that the discrepancy can be resolved to a more significant extent and only those students are marked present who are present all-time in the school and a correct measure of the strength of students can be passed on for various purposes and to solve this problem we are going to make use of a Deep learning concept Crowd Counting. Crowd Counting is a technique to count or estimate the number of people in an image.

Types of approaches for crowd counting technique-
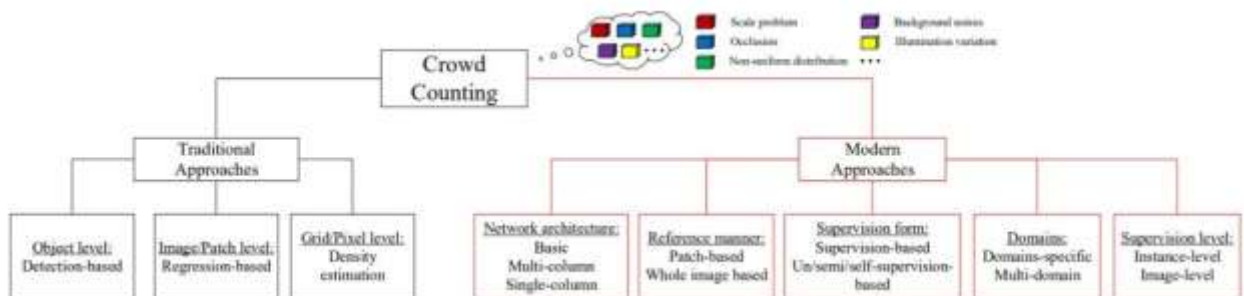
We will make use of regression-based approaches that directly learn the mapping from an image patch to the count. They usually first extract global features (texture, gradient, edge features), or local features (SIFT, LBP, HOG, GLCM). Then some regression techniques such as linear regression are used to learn a mapping function to crowd counting. These methods are successful in dealing with the problems of occlusion and background clutter, but they always ignore spatial information.

PROBLEM STATEMENT

Government Primary schools provide mid-day meals to the students , this scheme ensures children who do not get food at home will have at least one meal a day but it's being observed that the presence of students during mid-day meal time and during lecture time varies, not all students who are present during the mid-day meal are present in the lectures and this difference is not maintained in the records containing the count of students, thus it creates a discrepancy in the actual presence of students. So a solution consisting of a monitoring system needs to be proposed through which proper monitoring of students can be done and an approximate estimation of the students can be ensured.

OBJECTIVE

We aim to build a monitoring system that gives us an approximate count of students present in the class. This system keeps a track of students on a random basis, it estimates the count of students frequently so that the discrepancy in the actual presence of students can be avoided and accurate data containing a count of students present is utilized for various purposes without any fallacy.

The proposed system needs very elementary things such as a camera, laptop or personal computer, and local network. It estimates the attendance of each student by continuous clicking of images for some time period and finds the best-localized image for processing. This system can be used in the future to centralize online university relationships so that they can be controlled by the central office and communicate online through the Internet.

SCOPE

The main purpose of this study is to overcome the shortcoming of the mid-day meal scheme that is to reduce the cases of Fake enrolment of the students and corruption related to the financial benefits that are provided by the government. The main population that will be targeted is the primary school classrooms where the CCTV cameras are installed. That will send the data or the snapshot at any random instance of their timetable to count the number of students that are present in the classroom, in case of any difference between the provided data and the monitored data is found then an alert will be generated to the higher authorities. This overall procedure to install the cameras and configure the system will take approximately a couple of months but once the setup has been set for once then this duration will be highly reduced. Once all the primary schools gets covered then we will be targeting other monitoring for this mid-day meal scheme to make it more efficient and effective.

LITERATURE REVIEW

System monitoring comprises human face detection through a webcam where identification of image is done using an effective algorithm called Viola jones Algorithm. This paper intends to construct a mid-day meal monitoring system to track the nutrient in the food produced and to trace the distribution of food to local distributors and schools. The significant attribute of this system is to enhance the nutritional level of children from primary to upper primary classes. The conventional method of taking attendance is done manually by the teacher or the administrator. The proposed system needs very elementary things such as a camera, laptop or personal computer, and local network. It estimates the attendance of each student by continuous clicking of images for some time period and finds the best-localized image for processing. This system can be used in the future to centralize online university relationships so that they can be controlled by the central office and communicate online through the Internet.

PROPOSED METHODOLOGY

The major requirement of this solution is the installation of the CCTV cameras in each and every classrooms that are also compulsory nowadays, the installation of CCTV cameras are not only helpful in this solution but also they will be helpful in many other monitoring system. After the installation of the cameras and the system, the camera will be synchronized by the software that will be provided and this software has the Object Detection libraries that will be able to capture the count of students that are actually attending the class, there may be the difference of few student but we can expect the accuracy of almost 90% for the data provided by the school faculty and the data monitored using our system. After being matched if any vulnerabilities found then an Alert will be generated and the faculty may be answerable to these warnings provided by the system.

- **Flowchart**
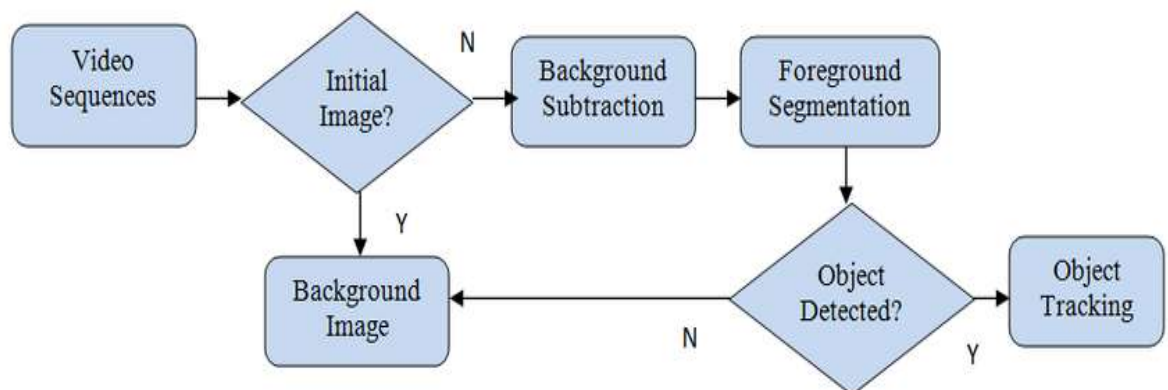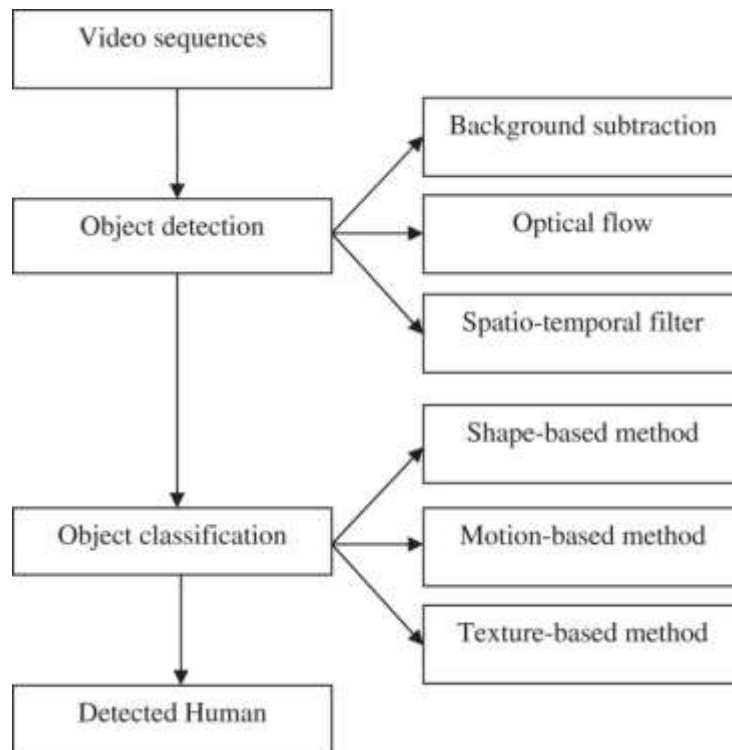
The Object detection will be done by using the YOLO library, it is extremely fast and accurate. In mAP measured at .5 IOU YOLOv3 is on par with Focal Loss but about 4x faster. Moreover, you can easily tradeoff between speed and accuracy simply by changing the size of the model, no retraining required!

Above is the sample of how the persons will be detected. This is just for an example because very similar thing will happen in the classroom where we loop throughout the students to get the count of them.

- **Algorithm Proposed**

Using computer vision for human detection accomplishes three distinct tasks:

- Picks objects out of background images.

- Proposes the objects as belonging to a certain class humans, in this case using a probability score.

- Defines the boundaries of the proposed people with x-y origins and height and length values.

On a higher level, there are two elements to consider when approaching human detection in an image using computer vision applications. First, there's the technical side how you can detect people in an image or a video. The second part is what you can do with the results, and has to do with the quality of the returns you get from your application.

How Object Detection Works ?

Generally speaking, solving the problem of how to detect objects in photo or video data starts with a systematic division of the image. First, the tool would apply algorithms to input with the intent of identifying regions of interest. The machine would then come up with a range of object proposals based on your settings. The final steps of detection are to classify objects based on models, apply probability thresholds and return the classes and the locations in the frame of your final accepted proposals.

The class you would be looking for, in this case, is humans. The applications detect these human objects in the visual field via processing blocks pre-trained by crunching a huge number of images with a deep learning artificial intelligence system. These processing blocks are known as models, and they can be trained to recognize almost anything humans can see.

When implementing human detection in your computer vision application, you can use a pre-trained model or supply the model yourself. The more data you give your model, the better your device will be at recognizing the objects you want and learning how to improve for the future.

How to Use Object Detection ?

After you have an output, it would be up to you how to use it. Your use case would determine various specifics, such as the detection thresholds. The best object detection tool for one situation may not work for others.

Machines have become effective in the past few years at performing these tasks due to advances in model training and multilayer deep processing. For example, Deepface and DeepID, two of the early vanguards of the feature extraction and comparison technique have become so efficient that many consumer-facing examples now exist: People now use the technology to unlock their tablets and phones, for example.

Cloud processing represented an important breakthrough in CV, putting powerful resources in the hands of developers everywhere. However, new CV platforms provide easy access to open API platforms, giving developers even more flexibility. Now, it's possible to build deep learning applications on devices at the edge. You don't need to be a computer vision expert and you don't need to rely on cloud connectivity to utilize core computer vision services, such as object detection, to process and analyze your images. Enterprises of all sizes can now build and deploy advanced computer vision applications on resource-constrained, low-power devices.
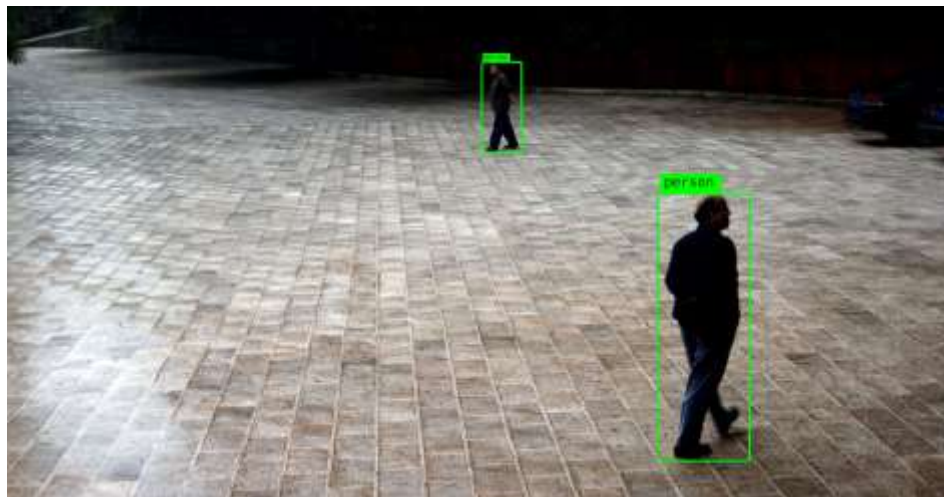
TECHNOLOGIES USED
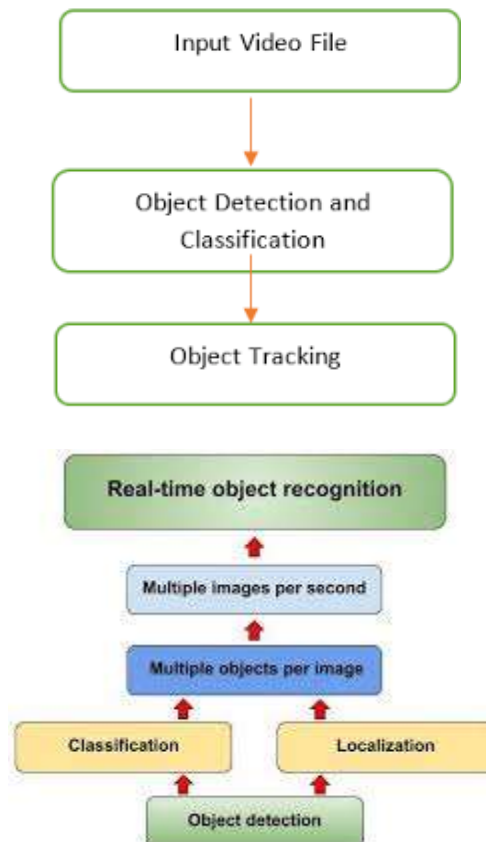
- YOLO Library

- Object-Detection

- Django

- Frontend : Html, CSS, Java Script

- Hosted through python anywhere

DIAGRAMS

One and two stage detectors

Object Detection

Two-Stage/Proposal

- RCNN
- Fast RCNN
- Faster RCNN
- RFCN
- Mask RCNN

One-Stage/Proposal-Free

- YOLO
- SSD

V7 Labs

Input Video File

↓

Object Detection and Classification

↓

Object Tracking

Real-time object recognition

↑

Multiple images per second

↑

Multiple objects per image

↑ ↑

Classification   Localization

↑ ↑

Object detection
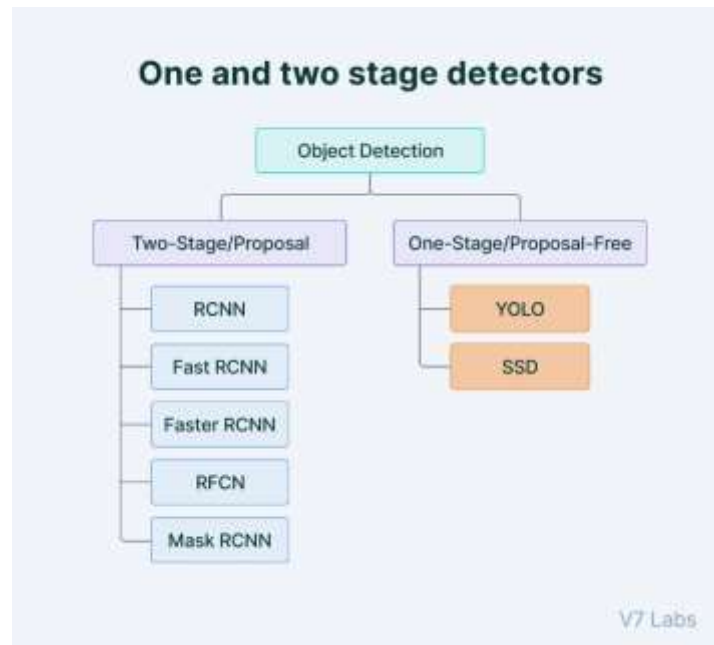
CONCLUSION

The project demonstrates real time attendance monitoring and counting system. We have successfully designed a system which not only helps the to count the number of person but can effectively contribute in power management of the building. The counter system calculates the number of people entering and exiting into a particular room. The counter value will increment if the person is entering the room and its value will decrement if the person is leaving the room. This count value of person entering or exiting is displayed on the 16x2 LCD in the real time basis. An e-mail is sent using Internet to the afore mentioned e-mail address of the user in a particularly defined interval of time using the real time clock extraction process. In future the systems performance will be improved by replacing the infrared to ultrasonic sensors.

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