

Implementing Automatic Object Categorizing by Applying Deep Learning and using Nvidia Jetson TX2

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Abstract - Deep learning over the years has become one of the most powerful techniques in the field of Machine learning. It can be applied to nearly every single possible field that human knows. These ways have dramatically improved the progression in speech recognition, visual beholding, object detection and plenty of different domains like drug discovery and genetic science. Deep neural networks have led to breakthroughs in processing pictures, video, speech and audio. In this research paper Nvidia Jetson TX2 is used as a controller. It controls the servo motor mechanism that controls the physical handling. This mechanical handling moreover helps to put the item in selected space. This system can be used in various workspaces such as car, Smart phones, electronic gadget manu-facturing industries etc which deals with large amount of smaller subparts.

Key Words: Deep Learning, Neural networks, Nvidia Jetson TX2, Machine learning, PLC's

1. INTRODUCTION

Deep Learning took a large boom and a large quantity of analysis came up in past few years. Neural networks have nearly resolved the matter of vision. Deep learning permits automatically learning multiple levels of representations of the underlying distribution of the information to be sculptured. In upcoming future, scientists are going to solve intelligence related problems more precisely. With the lot of analysis happening within the field of vision, it became knowledge base and has dilated from applied science to nearly each field.

NVIDIA Jetson TX2 is an embedded system-on-module(SoM) with dual-core NVIDIA Denver2 and quad-core ARM Cortex- A57, 8 GB 128-bit LPDDR4 and fully integrated 256-core Pascal GPU. It is one of the most powerful single board computer in the market for deep learning and computer vision. Jetson TX2 runs Linux and provides greater than 1TFLOPS of FP16 compute performance in less than 7.5 watts of power [1]. The process trade side of deep learning as a solution has remained a lot unknown. PLC's rules the industries and most of the sorting mechanism area unit are PLC controlled. Several new ways have emerged for separation of various things. If it involves various completely different

objects, it has to undergo varied processes adding a large quantity of time. This is often not favorable, thanks to the pace needed in processing trade. Adding a tool (camera) which may help us distinguish between completely different objects and simultaneously running a mechanism to separate objects. The theory of object detection has been applied to verify the objects. It'll facilitate in reduction of time which is used for sorting objects in industries by eliminating the additional processes required [2].

2. PROPOSED METHODOLOGY

The whole design built uses a DC and servo motor, camera interfaced with Nvidia Jetson TX2 and a mainframe computer as shown in fig 1.

The Direct current motor controls the transportation. The servos manage the categorization of objects. Nvidia Jetson TX2 act as the controller, that controls the action of DC and servo, motors. It additionally controls the action of camera, which clicks the exposure of object.

It also runs the deep learning technique, which supplies processed information about the various types of materials.

The whole operating system is split into 3 components, which are as follows:

i) Controller and knowledge acquisition

Nvidia Jetson TX2 controls the entire mechanism of method, from controlling servo and dc motors to the camera.

The article handling involves the movement of object from dc controlled transporter belt, through servo motor mechanism to the selected carton. It controls the action of dc motor and conjointly controls the angle of servomotor to guide the movement of the article into its designated place.

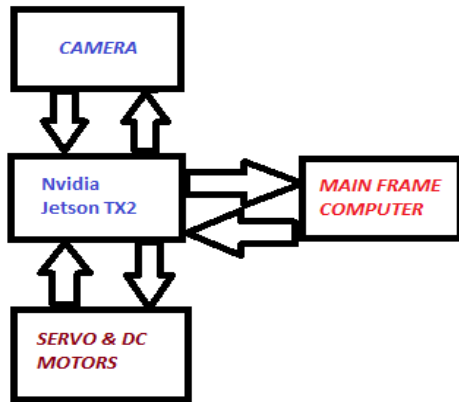


FIG 1. BLOCK DIAGRAM

ii) Categorization and transportation mechanism

The object is transported using transportation belt powered by dc motor. IC ULN2003 and Nvidia Jetson TX2 manage the rotation of dc motor that is stopped for a very small amount of time once the image is taken at the tip of transportation belt. When the analysis of image is done, the management signal rotates the servomotor at a particular angle. The servo connects the trail of the article to its selected destination. Here the objects are cube shaped boxes. The four classes of objects are chosen here for the demonstration for this method is as follows:

- a) Small and Black (SB)
- b) Big and Black(BB)
- c) Small and White(SW)
- d) Big and White(BW)

There are four containers placed for every class of article at the tip of transporter belt. The servomotor is set at degree angle signaled by controller, i.e. from 0° to 120°.

- 0° is for SB category
- 40° is for BB category
- 80° is for SW category
- 120° is for BW category

iii) Deep learning

One of the most vital parts of this design is the incorporation of Deep learning in the system. It is carried out in the mainframe computer. The picture of object is distributed from Nvidia Jetson TX2. Object identifier identifies the article, the computer sends the signal to Nvidia Jetson TX2, and hence action of servo and dc motors takes place.

a) Dataset

All the information of objects is collected by clicking image of objects completely in numerous lighting conditions and different environment. The gathering of information is not automatic and can be classified into two classes which are Black and White; however the categories can be modified in line with our liking. The information are often collected in line with the categories.

b) Design

The object detection system created makes use of GoogLeNet design which is associate twenty two layer deep model. This economical network achieves progressive accuracy employing a mixture of low dimensional embeddings and heterogeneous sized spatial filters [2].

c) Transfer Learning

Transfer learning was achieved with the pre-trained GoogLeNet design from Image Net. Rather than last layer, feature extractor for brand new dataset is supplemental which might draw a box round the object. This is based upon Tensor flow object detection API [2]. Comparison is formed by calculating the realm of box bounding the object. Initial comparison decides the scale of larger and smaller object.

3. WORKING

The Process of sorting item starts from transportation belt.. At first, the conveyer belt starts moving and therefore it places the primary object just below the camera and stops for a second. The camera clicks the photo and sends it to the Mainframe computer. Deep learning technique identifies the thing and its alternative characteristics like color and size. After the identification, the signal is shipped to the Nvidia Jetson TX2. It identifies the signal and aligns the servo according to the object. Now, the transportation belt starts once more and the whole method is perennial.

4. FUTURE WORK

Deep learning is a exciting young field, various industries will also get reshaped in the decades to come because of it. Deep learning can impact large sections of the industrial sector. Categorization is just a small portion of the system manufacturing industry, even more research can be successfully pulled out in several different parts of manufacturing. This will also contribute significantly to mechanization as well as productivity by reducing time and ultimately leading to human development [2].The introduction of new hard-ware will make this process much faster, cheaper and efficient in the upcoming future.

5. CONCLUSION

This paper focuses upon the usage of Nvidia TX2 which makes this process faster, powerful and less prone to error on separation of various objects by applying deep learning. This method can be used in various industries which require faster sorting and separation of objects. This work is a part of adaptation of artificial intelligence in the manufacturing industry. More and more Industries will adapt Deep Learning in the coming years. Deep learning is industry's future.

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