

Wildlife Monitoring in Zoological Parks Using RASPBERRYPI and Machine Learning

Sk. Nayab Rasool, T. SR.CH.Murthy

Abstract— Wildlife monitoring in zoological parks using raspberry pi is the application of science and technology to monitor the wildlife enclosures in zoological parks and to maintain the security of animals. Recently many incidents that occur in zoo parks like animals escaping from cages and causing damage to other animals and humans, and also sometimes humans also fall into the enclosures of animals. Hence, designed a system that can monitor such conditions. This system is used for surveillance and security of animal to detect the intruder that entered the area of animals and also to detect if the animal escaped or missing from the enclosure. This system could also label what intruder has entered the enclosure using Machine Learning. The system consists of raspberry pi camera Rev 1.3 and SD card circuitry interfaced to a raspberry pi B+ board. The raspberry pi camera takes the video of the cage and gives to the raspberry pi, then the obtained video streaming data is analyzed using opencv platform. In opencv platform the data is classified using Machine Learning algorithms. The data is analyzed to check whether any intruder entered the cage or if the animal escaped from the cage. If any of the conditions mentioned above occurs then the alerts are sent to the caretaker using IoT.

Key words: Wild life, raspberry pi, Machine Learning, Python, open cv

I. INTRODUCTION

Wildlife monitoring plays a key role in a extensive range of medical activities and societal pursuits. Understanding animal conduct and activity patterns is useful for comparing biodiversity and modifications in habitats and land use, heading off dangerous human flora and fauna encounters and damaging habitat overlap, monitoring species health and populace dynamics, and presenting human beings with excessive effect educational stories. Advancements in technology innovations primarily focus on monitoring and controlling of different activities. There is increasingly a demand to reach the human needs. Most of this technology is mainly focused on efficient monitoring and controlling different activities. An efficient surveillance system is required to monitor and maintain the security of wild animals in zoological parks, and for monitoring of their enclosures. Recently many incidents that occur in zoo parks like animals escaping from cages and causing damage to other animals and humans in the zoo, and also sometimes humans also fall into the enclosures of animals and put their life to threat. Some of the cases are shown below,

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Sk. Nayab Rasool, Asst.Professor ,Dept.of ECE, Anurag Group of Institutions, Hyderabad, Telangana, India.(Email: nayabrasool@cvsr.ac.in)

T. SR.CH.Murthy, Asst.Professor ,Dept.of ECE, Anurag Group of Institutions, Hyderabad, Telangana, India.(Email: murthytommandrue@cvsr.ac.in)



People end up in animal enclosures at the zoo for various reasons, accidental and deliberate. On the left, a man tries to pet a lion at a zoo in India and on the right, rescue workers help a zoo worker who fell into the gorilla enclosure at the Los Angeles Zoo.



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Delhi Samachar: White tiger kills boy at New Delhi zoo.



Tiger escapes from enclosure at Nehru zoo

Sunday, Aug 23, 2015, 10:24 AM

HYDERABAD: In yet another security lapse at the Nehru Zoological Park (NZP) on Saturday, a Royal Bengal Tiger gave anxious moments to officials and visitors after it escaped its enclosure after scaling a 10 feet high fence.



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Therefore, there is need to monitor such conditions and alert the caretakers at right time, designed a system that can monitor such conditions. This system is used for surveillance and security of animal to detect the intruder that entered the area of animals and also to detect if the animal escaped or missing from the enclosure. The system consists of raspberry pi camera Rev 1.3 and SD card circuitry interfaced to a raspberry pi B+ board, uses the power supply of 5v,2.5 amps. The raspberry pi camera takes the video of the cage, gives to the raspberry pi, then the obtained video streaming data is analyzed using opencv platform. In opencv platform the data is classified using machine learning algorithms. The data is analyzed to check whether any intruder entered the cage or if the animal escaped from the cage. If any of the conditions mentioned.

II. MACHINE LEARNING

Machine learning is an application of artificial intelligence (AI) that gives systems the capacity to routinely study and enhance from experience without being explicitly programmed. Machine learning specializes in the development of system applications which could get right of entry to statistics and use it study for themselves. It is interdisciplinary field that enables system to learn from data rather than through explicit programming. In simple words it is using data to answer questions, it is a key for unlocking the hidden insights in the data.

In conventional programming people are used to find the solution to the problem with step by step procedure where as in machine learning the problem can be solved using data sets with appropriate algorithms. The computer can be trained using training dataset and tested with the testing dataset the system learns with experience of training and gives the right solution . based on the patterns in data, system will take higher alternatives in future depending at the statistics gave

The super issue is to permit the desktops adapt consequently with out human intercession or help and alter sports effectively.

laptop vision and object Detection

one of the large fields of automated reasoning is laptop vision. pc imaginative and prescient is the have a examine of laptop and programming frameworks which could understand pix and scenes. computer vision is moreover created from various angles, for example, image acknowledgment item discovery, picture age, photograph great goals and the sky's the restrict from there. Article reputation is probable the maximum huge a part of laptop imaginative and prescient because of the quantity of cheap use times.

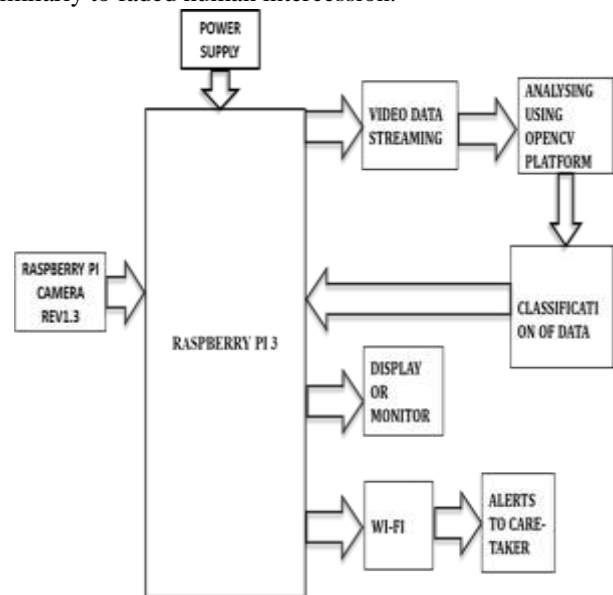
object identity alludes to the capacity of laptop and programming frameworks to discover protests in a picture or scene and understand each article. object vicinity has been usually carried out for face recognition, automobile discovery, passerby tallying, internet pics, safety frameworks and reason force less motors. The big majority of the execution of article location includes using calculations of AI upheld in open CV, the widely recognized computer modern and farsighted library.

they may be severa surprisingly true item identity

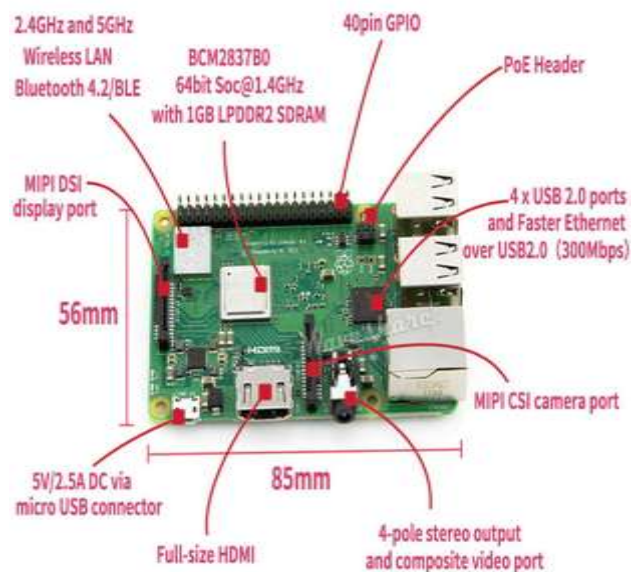
calculations and strategies along side CNN, R-CNN, speedy-RCNN, Retina internet and expedient but pretty proper ones like SSD(single shot region) and YOLO(you virtually appearance as quickly as).

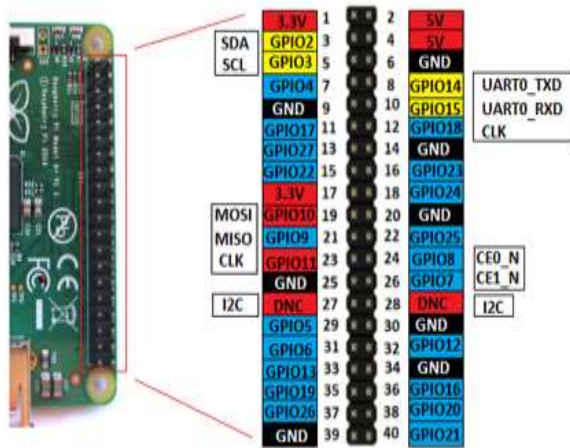
IoT (net of things)

The net of factors (IoT) is the internetworking of bodily devices, engines (associating units, and smart gadgets), houses, and precise gadgets which includes hooked up with hardware, software program software's, sensors, actuators, prepare availability that empower the ones gadgets to accumulate and alternate data. The IoT permits articles to be detected or oversaw remotely crosswise over modern-day system framework, developing open doors for added direct coordination of the big worldwide into computer essentially based totally frameworks, and coming about in ventured beforehand execution, precision and cash associated boom similarly to faded human intercession.



Block Diagram





Raspberry Pi 3 B+ board description

Fig.Raspberry pi 3 B+ pinout

The Raspberry Pi virtual digital camera Board plugs at once into the CSI connector on the Raspberry Pi. It is able to supply a crystal smooth 5MP decision picture, or 1080p HD video recording at 30fps. Version 1.Three, The module attaches to Raspberry Pi, through way of a 15 Pin Ribbon Cable, to the dedicated 15-pin MIPI digital digicam Serial Interface (CSI), which have become designed in particular for interfacing to digital digital camera.

This system is developed on Python programming language, and open CV (Open Source Computer Vision Library)on Raspberry Pi single-board

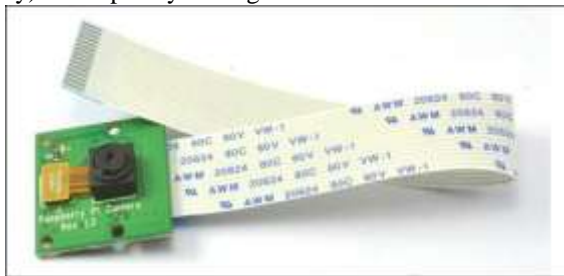


Fig.Raspberry Pi camera board Rev 1.3

The Raspberry Pi single - board framework has acquired Python as its vital programming language. Libraries comprising of NumPy, SciPy and Matplotlib allow the effective utilization of Python in logical figuring. Python is generally utilized in guy-made reasoning errands with the help of libraries like TensorFlow, Keras and Scikit-learn. As a scripting language with specific shape, sincere linguistic structure and wealthy published substance coping with devices, Python is every sometimes applied for common language making geared up.

Libraries of Open CV

NumPy

NumPy, which represents Numerical Python, is a library, for example, multidimensional exhibit devices and a meeting of sporting activities for purchasing organized those clusters. making use of NumPy, clinical and coherent responsibilities on reveals may be completed. NumPy is regularly executed collectively with responsibilities like SciPy (clinical Python) and Matplotlib (plotting library). This gathering is appreciably performed as an opportunity for MatLab, a

celebrated stage for specialized processing

Pandas

Pandas is an open-supply, BSD-jail Python library providing exorbitant normally execution, clean to-utilize facts structures and records assessment devices for the Python programming language. Pandas name is gotten from the word Panel statistics – an Econometrics from Multidimensional records. previous Pandas, Python modified into significantly carried out for statistics munging and path. It had nearly no dedication within the route of statistics exam. Pandas illuminated this problem. the use of Pandas, we will gain 5 famous strides inside the dealing with and assessment of information, no matter the birthplace of information — load, plan, control, version, and dissect. Python with Pandas is utilized in a large series of fields which include scholastic and enterprise business enterprise vicinity names along fund, economic topics, information, studies, and so on.

Tensor flow

TensorFlow is the AI shape that Google made and used to configuration, assemble, and teach profound gaining knowledge of fashions. TensorFlow library can be applied to numerical calculations, which in itself does now not display up very top notch, but the ones calculations are finished with facts movement diagrams. Figure shows the system Set up

The set up consists of Raspberry pi 3 B+ model board, an enclosure set up, Raspberry pi camera Rev 1.3, a display or monitor to view the results, a VGA to HDMI cable to connect Raspberry pi 3 B+ board to the display or monitor, a USB keyboard and mouse to run the code and enable Wi-Fi and a power adapter of 5v 2.4 amps to power the entire kit.

III. TEST PROCEDURE & RESULTS

The components are initialized by supplying the required power of +5v, 2.5 amps. We are using rev 1.3 raspberry pi camera to monitor the enclosure of the animal and to get the video information. This video information is analyzed using OpenCV platform using machine learning methods and algorithms. Initially the model is trained with the predefined dataset of different animals and humans. After training is done the final code is written which has the conditions to be tested. The first condition is if there is any intruder in the enclosure that may be any other animal or human. The second condition is if the animal escaped from the enclosure. When any of the condition is observed while analysing the live video stream the alert is sent to the caretaker. The system is able to classify and label the type of intruder that enters the enclosure.

The project is trained giving bear as the main animal. So when a bear is present in front of the camera it identifies it as bear and sends no alerts.

The project can detect if any other intruder enters the cage and can also identify the type of animal entered as shown below and sends alerts to the caretaker.





Figure showing the detection of bear

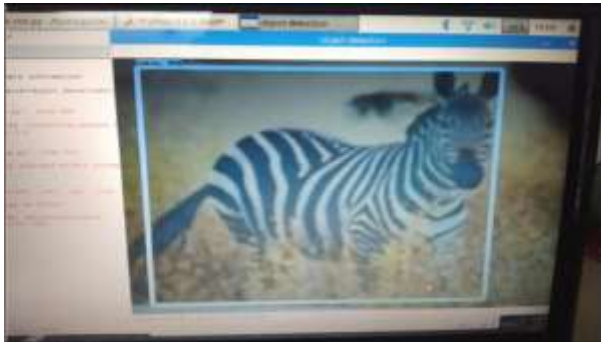


Figure showing detection of the entered animal Zebra

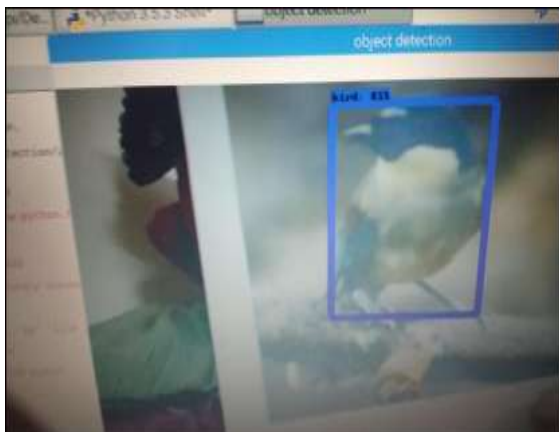


Figure showing detection of the bird

The system detects the persons also and send alerts to Zoo care takers if any human enters the enclosure

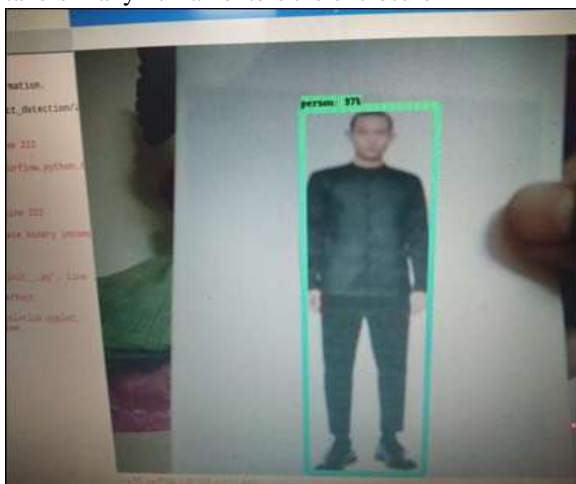


Figure showing detection of person



Figure showing detection of person

IV. CONCLUSION & FUTURE SCOPE

Proposed system will provide a competent method for taking the enclosure data and help the zoological park authorities to take proper care on the security of animals and visitors. This system can help in reducing the number of life-threatening cases at zoological parks and maintain a safe environment.

The current system design involved a single cabled camera and the model is trained upon few animals, the functionality of device can be improved by using wireless cameras and accessing the camera data through IoT. The present model can be trained with more amount of data to have best accuracy and proper prediction. A separate cloud instance may also be developed to cater to the needs of the specific application. Increased processing power can be obtained, if required, using computationally advanced control units. This system with the above-mentioned developments can be perfectly deployed into the zoo parks in real time for better monitoring and security system in zoological parks.

REFERENCES

1. Gareth Mitchell, The Raspberry Pi single-board pc will revolutionize computer era coaching [For & against], Vol.7, NO.three,pp. 26, 2012.
2. Charles Severance, "Eben Upton: Raspberry Pi", vol.forty six, NO.10, pp. 14-16, 2013.
3. Surveillance and tracking system the use of Raspberry Pi and SimpleCV 978-1-4673-7910-6/15/\$31.00_c 2015 IEEE
4. Chris Edwards, "now not-so-humble raspberry pi receives huge thoughts", vol.eight, NO.3, pp. 30-33, 2013.
5. Matt Richardson and Shawn Wallace, Getting started out with Raspberry Pi. the us of the united states: O'Reilly Media, 2013.
6. Peter Membrey and David Hows, study Raspberry Pi with Linux. large apple metropolis: Apress, 2012, pp. 1-149
7. Eben Upton and Gareth Halfacree, Raspberry Pi person guide. A John Wiley and Sons Ltd., 2012.
8. Python software basis[US], <https://pypi.Python.Org/pypi>
9. Raspberry Pi foundation, <http://www.Raspberry.Org>



10. OpenCV. <https://opencv.org>1278
11. H. Kuehne, H. Jhuang, E. Garrote, T. Poggio, and T. Serre, "HMDB: A big Video Database for Human movement reputation", ICCV, 2011
12. Hu, Weiming, et al. "A survey on visible surveillance of object movement and behaviors." IEEE Transactions on systems, man, and Cybernetics, component C (programs and reviews) 34.3 (2004): 334–352.
13. Borg, M., Thirde, D., Ferryman, J., Fusier, F., Valentin, V., Bremond, F. & Thonnat, M. (2005). "Video Surveillance for aircraft interest tracking," IEEE convention on superior Video and sign based totally completely Surveillance, pp. 16–21.
14. "device learning For Absolute novices: A simple English introduction (2d version)" via Oliver Theobald
15. "tool getting to know For Dummies" thru John Paul Mueller and Luca Massaron