

Hands on with Go PRO camera

(Micro-project report)

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Abstract

Object detection refers to the process of identifying and localizing objects of interest within an image or video. It is a fundamental task in computer vision with many practical applications, such as autonomous vehicles, surveillance, and robotics. Object detection algorithms typically involve the use of machine learning techniques, such as deep neural networks, to accurately detect and classify objects within an image or video.

1 Camera specifications

- GP2 processor gives more speed, better resolution and shoot 5.3K60 + 4K120 video.
- 23 Megapixels of camera.
- Advanced video stabilization + with horizon levelling up to 45°.
- Automatically upload footage to the cloud while your GoPro charges.
- Easy wireless offloads to the Quik app, now up to 30% faster.
- Lightning-fast wired connection via USB
- Waterproof to 33ft + built tough.



2 Objectives identified

- To detect the moving or underwater object as it has the application of capturing videos up to 33ft underwater

3 Applications of camera

- Go Pro camera is designed to capture videos or photos at extreme conditions, the small size and light weight of the camera makes it easier to carry and use it in narrow spaces unlike DSLR cameras or mobile phone cameras. The camera can also be attached to a drone and can capture videos from high altitudes.
- Action sports: The HERO 10's durable and waterproof design, along with its ability to capture high-quality video in a wide range of environments, make it a great choice for filming action sports like surfing, snowboarding, and mountain biking.
- Travel and adventure: The HERO 10's compact size and versatile mounting options make it easy to bring along on all sorts of adventures, from hiking and camping trips to sightseeing in new cities.
- Vlogging and content creation: The HERO 10's high-quality video and image stabilization features make it a popular choice for vloggers and content creators who need a reliable and portable camera for capturing footage on the go.

4 Experimentation carried out

- Go Pro camera is immersed in water to capture the video of moving fish.
- The captured video is used in MATLAB code for object detection[1] (fish in this case).
- The processed video in MATLAB highlights the moving object in a rectangular box.

5 MATLAB code implementation

- This code performs moving object detection on a video by looping through each frame and applying various image processing techniques such as thresholding and median filtering to detect and filter

out objects based on their size. The detected objects are stored in an array and then displayed on each frame with bounding boxes and centroids drawn around them. The result is a video with moving objects highlighted.

6 Learning Outcomes.

At the end of this microproject, we learnt

- Using basic filters to remove noise from the image (or particular frame in case of video).
- Detection of moving object using thresholding method.

7 Algorithm of MATLAB code used

Read the MP4 video using VideoReader function and store the frame rate and the number of frames in variables.

Initialize an empty cell array to store the detected objects for each frame of the video.

Set the parameters for moving object detection, such as the threshold factor, minimum and maximum areas of the objects.

Loop through each frame of the video and perform the following operations on each frame:

- a. Read the current frame.
- b. Convert the frame to grayscale using rgb2gray function.
- c. Apply a median filter to remove noise using medfilt2 function.
- d. Apply a threshold to binarize the image using imbinarize function. Here, the difference between the current frame and the previous frame is taken to detect the moving objects.
- e. Detect objects in the binary image using regionprops function, which returns the bounding boxes, areas, and centroids of the objects.
- f. Filter out small and large objects using the area information.
- g. Store the detected objects in the cell array for the current frame.
- h. Set the current frame as the previous frame for the next iteration.

Loop through each frame of the video again and perform the following operations on each frame:

- a. Read the current frame.
- b. Retrieve the detected objects for the current frame from the cell array.
- c. Draw the bounding boxes and centroids around the detected objects using insertShape and insertMarker functions.
- d. Display the frame with the detected objects.

End of the program.

This algorithm detects moving objects in a video by using the difference between the current frame and the previous frame. It applies thresholding, regionprops, and filtering to detect and extract the objects, and then draws the bounding boxes and centroids around the detected objects to visualize the results.

References

- [1] Alandkar, Lajari & Gengaje, S. (2016). STUDY OF OBJECT DETECTION IMPLEMENTATION USING MATLAB. 10.15623/ijret.2016.0508020.