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Image-Based Geographical Location Estimation Using Web Cameras

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ABSTRACT

This paper describes a technique for estimating the situation of Associate in Nursing IP-connected camera (a net cam) by analyzing a sequence of pictures obtained from the camera. First, we have a tendency to classify every image as Day/Night mistreatment the mean physical property of the sky region. From the Day/Night pictures, we have a tendency to estimate the sunrise/set, the length of the day, and native high noon. Finally, the geographical location (latitude and longitude)of the camera incalculable. The experiment results show that our approach achieves affordable performance.

Addresses the problem of computing the geo-location from only two shadow trajectories and corresponding footprints on uncelebrated images. Today there isn't any search engine other than some of the above mentioned ones that provide a better responsiveness to the user's request for the result.

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I. INTRODUCTION

Thousands of sensors are connected to the net. The "Internet of Things can contain several "things" that are image sensors. This immense network of distributed cameras (i.e. net cams) can still exponentially grow. We tend to have an interest in however these image sensors will be accustomed sense their atmosphere. In particular during this paper we tend to investigate straightforward ways for the way one will confirm metrics of a location (e.g. sunrise/sunset, length of day) and also the location of the online camera by observant the camera output.

The location of some extent on the world is delineate by its latitude and line of longitude (and maybe by its altitude on top of ocean level). Latitude is measured in degrees north or south of the Equator, 90◦ north latitude is that the North Pole and −90◦ south latitude is that the pole. Line of longitude is measured in degrees east and west of Greenwich, England. 180◦ east {longitude|meridian|line of line of longitude|great circle} and −180◦ west longitude meet and kind the International Date Line within thePacific [6], [7], [8]. The definition of sunrise and sunset is once the geometric celestial point distance of the middle of the Sun is 90◦50′ [9]. That is, the middle of the Sun is geometrically fifty arcminutes below a horizontal plane. There are varied definitions for sunrise/set and daylength [10].

Several approaches are reported with relevancy finding a location from pictures. The sunrise and sunset were determined by classifying pictures taken from a digital camera and also the location was then calculable. For crucial the sunrise and sunset, the intensity of the image was accustomed classify day or night and so verify the noontide (or native noon) time to spot the line of longitude and latitude. In [12] the sky region is known by victimization image information taken below numerous climate, predicting the star exposure employing a commonplace sun path model, and so tracing the rays from the sun through the pictures. In [13] vehicle sight ion and chase is employed to detect road conditions in each day and This work was part supported by the endowment of the Charles William Harrison Distinguished chair at Purdue University. Address all correspondence to Edward J. Delp, ace@ecn.purdue.edu night pictures by victimization pictures and measuring system sensors. A wayto retrieve the weather info from information of still pictures was given in [14]. The sky region of image was detected by victimization the distinction of component values from consecutive image frames, morphological operations were then accustomed get a sky region mask. The atmospheric condition was recognized by victimization option like colour, shape, texture, and dynamics.

Our goal is to classify an image with simple features. For indoor/outdoor classification, we compute features based on

sub-blocks of the image instead of using features for the entire image. The process begins by detecting the sky region for an image from each camera. Next all images are converted from the RGB to Y CbCrcolor space and the Y component of each image is extracted. To estimate the sunrise and sunset. Finally, the latitude and longitude are obtained using the estimated sunrise and sunset.

Today with a large number of people depending on Internet technology for the help even to see how stuff works, etc. So there should be enhanced results which are otherwise best provided by Google only.

- Aspect based Searching is not yet implemented by major content providers for a better result.

None of the search engines, not even Google support the one of the ignored but applicable aspect of searching, i.e., image searching with image as a source for searching. Firstly, the verification pictures square measure designed to cover within the generic share pictures instead of appending with them to keep up additional verification shares.

II. LITERATURE REVIEW/RELATED WORK

[1]" The Internet of Things: A survey", in recent year, the Internet of Things (IoT) has drawn significant research attention. IoT is considered as a part of the Internet of the future and will comprise billions of intelligent communicating 'things'. The future of the Internet will consist of heterogeneously connected devices that will further extend the borders of the world with physical entities and virtual components. The Internet of Things (IoT) will empower the connected things with new capabilities. In this survey, the definitions, architecture, fundamental technologies, and applications of IoT are systematically reviewed. Firstly, various definitions of IoT are introduced; secondly, emerging techniques for the implementation of IoT are discussed; thirdly, some open issues related to the IoT applications are explored; finally, the major challenges which need addressing by the research community and corresponding potential solutions are investigated.

[2]" Internet of things: Vision, applications and research challenges ", The term "Internet-of-Things" is used as an umbrella keyword for covering various aspects related to the extension of the Internet and the Web into the physical realm, by means of the widespread deployment of spatially distributed devices with embedded identification, sensing and/or actuation capabilities. Internet-of-Things envisions a future in which digital and physical entities can be linked, by means of appropriate information and communication technologies, to enable a whole new class of applications and services. In this article, we present a survey of technologies, applications and research challenges for Internet-of-Things.

[5]" Edge-based detection of sky regions in images for solar exposure prediction", A device for predicting the solar exposure at a location operates by gathering image data from that location with a known camera orientation. The image data is then processed to identify the sky regions and the solar exposure is predicted using a standard sun path model and tracing the rays from the sun through the processed images. Critical to the success of this technique is the image processing used to separate the sky from the rest of the image. This work is concerned with developing a technique which can do this for images taken under different weather conditions. The general approach to separate the sky from the rest of the image is to use the Canny edge detector and the morphology closing algorithm to find the regions in the image. The brightness and area of each region are then used to determine which regions is sky. The Flood Fill algorithm is applied to identify all pixels in each sky region.

III.PROPOSED SYSTEM

Sunrise/Sunset Estimation

Sunrise and sunset are often obtained by classifying every image from the camera with the label "Day" or "Night." one in every of the factors that may be used for sleuthing Day/Night is that the brightness of the image. In [11], the mean of the combined RBG parts were wont to notice Day. In our work, we tend to use the luminousness to live the brightness of the image. We tend to 1st convert from the RGB to Y CbCr color house and use the Y element to get the common luminousness. We tend to assume that a picture with massive luminousness tends to be Day. We've got unheeded camera AGC effects. we tend to acknowledge that this introduces error in our estimates for sunrise and sunset due the actual fact that the photographs are"brighter" than traditional. In our operational situation we'vegot no management of this therein we tend to cannot shut down the camera AGC.

Sky Region Detection

There area unit several strategies for detection the sky region in a picture. In [13] sky detection is simply thought of for the special case wherever the photographs area unit the front read from dash cameras in vehicles. In [12] edge detection of sky region is employed to predict the star exposure. They describe a general approach to separate the sky from the remainder of the image by decisive the stingof the sky region. The accumulative frame distinction between a picture and also the sequent imageis employed to extract the sky region in [14].

The sky is assumed to be at the highest of image and also the clouds area unit dynamic. Victimisation this technique needs many sample pictures todiscover the sky region. Also, it's valid only the sampleimages area unit Day pictures since the tactic is predicated on the very fact that the sky is dynamic compared to the foreground objects. We have a tendency to propose a unique approach to discover the sky region by victimisation one image of a transparent sky. By clear sky we have a tendency Tomean no clouds within the sky and in our initial experiments this image was manually chosen.

The sky detection approach we used is then:

1) Extract an image from the blue channel of the camera.
2) Use the Canny edge operator to find edges. This will createa binary image or edge mask where edge pixels are set to 1.
3) Use morphological filtering (dilation) to close gaps in theboundaries of the edge mask.
4) Invert the dilated binary image (edge mask) where theboundary pixels are inverted from 1 to 0 and the surfacepixels are inverted from 0 to 1.

5) Find the largest connected region at the top of the binaryimage:
   a) Find all the connected components in the binary image.
   b) Sort the connected components with respect to the number of pixels contained in descending order.
   c) For each of the connected components check the location of each connected component to determine whether it is at the top part of the image. If the connected component is at the top part of the image, select it as the sky region and if not, go to the next largest connected component. Repeat until the sky region is found. The results of using the above sky detection technique are shown in Fig 1.

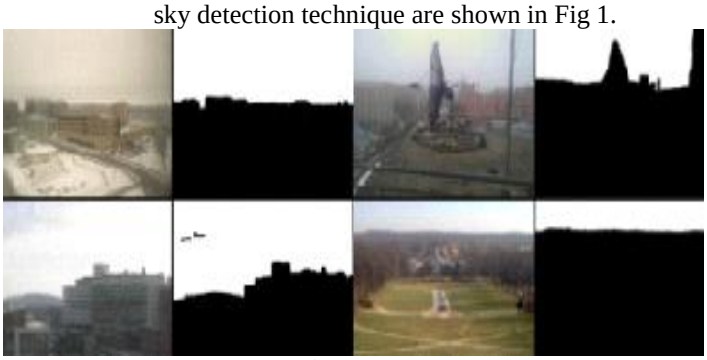
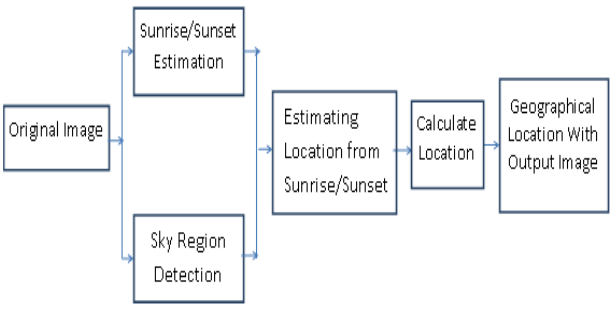


Fig1. Collection of images and Skymask

IV. ARCHITECTURE



Sunrise/Sunset Estimation

Sunrise and sunset can be obtained by classifying each image from the camera with the label "Day" or "Night." One of the factors that can be used for detecting Day/Night is the brightness of the image. the mean of the combined RBG components were used to detect Day.

Our method is a variation of the above in that we focus on the sky region and find the mean of Y in the sky region:

$$Y_{sky_i} = \frac{1}{M}\sum_{j=0}^{M-1} Y_{sky_{i,j}}$$

Where $Y_{sky_i}$is the mean sky luminance of the i^{th}image and $Y_{sky_i\,,j}$is the luminance of the j_{th}pixel in the sky region of the it image. M is the number of pixels in the sky region. Here we assume that the camera is static and the sky region for the camera remains the same for all the images.

We will estimate sunrise and sunset by detecting transitions from Night to Day and Day to Night. To detect Day/Night transitions from the luminance of the sky region, a threshold must be determined. If we assume the images are obtained over a 24-hour period, we know that approximately a quarter of the images are either Day images or Night images if the camera is located in the latitude range between 60 ◦S and 60 ◦N. Since Y_{sky_i} has large value for Day and small value for Night, we can find a threshold for Y_{sky_i} to label the image as Day or Night. Two different thresholds for classifying Day/Night can be used:

$$th_{mean} = \frac{1}{N}\sum_{i=0}^{N-1} Y_{sky_i}, \qquad 2.$$

$$th_{mid} = \frac{\max\{Y_{sky\_i}\} + \min\{Y_{sky\_i}\}}{2}$$

Estimating Location from Sunrise/Sunset:

Using the CBM day length model [10] we estimate latitude by:

$$\theta = 0.2163108 + 2\tan^{-1}[0.9671396\tan[0.00860*(J-186)]]$$

$$\emptyset = \sin^{-1}[0.39795\cos\theta]$$

$$D = 24 - \frac{24}{\pi}\cos^{-1}\left[\frac{\sin\frac{p\pi}{180} + \sin\frac{L\pi}{180}\sin\emptyset}{\cos\frac{L\pi}{180}\cos\emptyset}\right]$$

Where is the revolution angle, J is the day of the year, is the sun's declination angle, D is the day length, and L is the Latitude. By numerically solving Eq.

We can estimate latitude (L) from day length (D) and the day of the year (J). In this paper, the day length coefficient (p) was set to 6.0 to correspond to the day length definition which includes civil twilight. D is the time difference between the sunrise and sunset. Longitude can be estimated from local noon [15]. If we know UTC (Coordinated Universal Time) when the sun is at its highest point in the sky at a location on the Earth (local noon), then we can determine the time difference between the local noon and the noon in UTC. The time difference can be converted to longitude (l) since we know that the Earth approximately rotates 15 degrees per hour.

$$l = \begin{cases}(12-n+u)*15 & u \le 12\\ (n-u+12)*15 & u \le 12\end{cases}$$

Where n is the local noon and u is the UTC offset for the local area. All the variables l, n and u are in unit of hours. The local noon can be approximately estimated from sunrise and sunset.

$$n = \frac{t_{sunset} + t_{sunrise}}{2}$$

Where t sunset and t sunrise are the local time of sunset and sunrise in hours. Since the earth rotation is nearly constant, we assume that at the middle of the sunrise and sunset, the sun is at its highest point is the sky.

V. CONCLUSION

We consider the issue of evaluating the rough area of a web cam by breaking down its pictures. We demonstrated that we could viably evaluate areas with under 2.4% slip for the longitude and under 5% mistake for the scope. In future work we will explore how we can adjust for camera AGC impacts and fine grained transient estimations. We anticipate utilizing web cams to identify climate conditions and different sorts of ecological observing. We are keen on collecting these estimations more than 10s of a huge number

of openly accessible web cams. This is an extremely fascinating huge information issue.

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