SELFIE PROCESSING FOR OPTIMIZED ROAMER TRACKING SYSTEM (SPORTS)

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Abstract

In this paper a novelistic model implemented to track location of mobile users when they snapped a 'Selfie'. This framework integrates Geographical Positioning System (GPS) and Selfie Image Processor (SIP) with special 3D projection modeler. This implementation provides security to the mobile users with a unique co-operation of two modules GPS and SIP. This framework is useful for roamers (women, children, tourists, journalists and youngsters) during their roaming (journey) time. The special fusing of GPS and SIP modules in smart phones automatically registers the location of a roamer at Global Security Server whenever a Selfie captured via phone camera.

Key Words : Image Processing, Selfie, GPS, SIP, Enumeration, Viewing Angle, Localization

1. INTRODUCTION

The modern Smart Phone technologies support wide range of services. Integration of high resolution digital cameras with smart phones made them more convenient digital image capturing devices. 'Selfie' [2] is a photograph taken by self with a smart phone or a Selfie Stick, to share photos via social media. The popular Instagram service [12] supported with various social media web sites (FACEBOOK, GOOGLE and YAHOO) supports instant sharing of digital images captured by smart phones. The modern digital image processing technology supports high scaled statistical tools to analyze the digital metrics of image data. The Geo-Tagging technology [4, 7] services easily identify the locations over the globe along with geometrical measures. The 3D image modeling tools used to generate perspective angular views for any single view of image [6]. There are bundle of third party tools to support 3D image processing technologies. New Stereo Vision Estimation employs SAD technology to estimate the distance of objects by reconstructing the scene from 2D to 3D [8]. The Pin-Hole camera model is the fundamental model to generate perspective views of images using digital cameras. This model maps 2D co-ordinates to 3D co-ordinates and vice versa.

In Section 2 smart service technologies required for this work are overviewed. In Section 3 the implementation of SPORT system discussed. In Section 4 results are analyzed followed by conclusion.

2. SMART SERVICES

2.1 *Instagram Services*

Instagram Supports online photo/video sharing with social network services. It was created by Kevin Systrom and Mike Krieger [12] in 2010. The service gained rapidly popularity with currently 450 Million users across the globe. The major services supported by Instagram are:

- Hash-Tag, Through-Back and Selfies. Used to share photos or videos among social media.
- Newly enhanced Explore Tab panel approach for moderate browsing of photo gallery.

- 28 In built Photo-Filter techniques to turn images into required effects.
- ‘Lux’ tool to adjust saturation and brightness levels of photos on move.
- Instagram introduced video sharing also from 2013 and currently it increased the video length limit to 60 seconds from 15 seconds.
- Instagram-Direct a private network photo sharing feature which protects data sharing from public networks.

2.2 Global *Positioning System*

The GPS system used to fetch details of location, latitude, longitude and altitude with time stamp. An unique identification code IMEI (International Mobile Equipment Identity) [9, 11] used to track specific roamer/mobile device. Wide range of apps supported by Android/Windows/Mac operated mobile phones facilitates GPS data management and organization. The basic and cheap way of communication from GPS transmitter to receiver is SMS with many optional resource consuming channels.

2.3 *Global Packet Radio Service*

The GPRS offers location identification service using NMEA (National Marine Electronics Association) [14] server to gather global position information associated with GIS (Global Information System). The GPRS packets behave as data carriers between servers to client (mobile). Both GPS and GPRS follow three phased communication for generating location information of authenticated roamer. Three phases are *Management, Communication* and *Map Phase*.

2.4 *Camera Projections*

The object location from a given digital image can be identified by estimating its viewing angle from lenses. The geographical real-time scanners provide various angular views of an object from current location of estimation. The major camera angles used for this work are shown in figure 1.

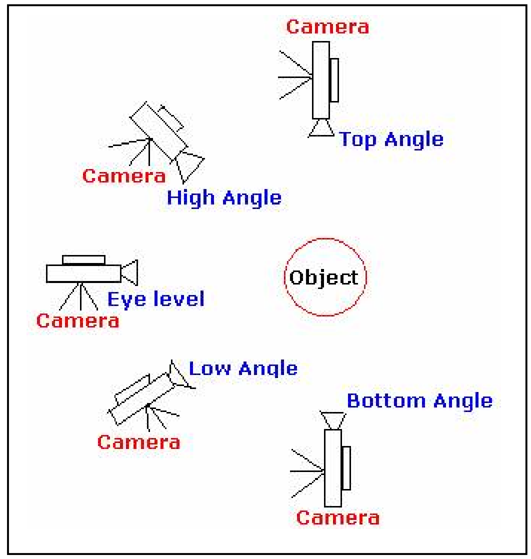

Figure 1. Camera Projection views for 3D object

The ***‘Angle of Vision’*** [13] used to estimate the distance of an object in real world from the focal point of vision. Figure 2 represents the angle of vision (α) supported by camera technology where lens representing focus of a human eye.

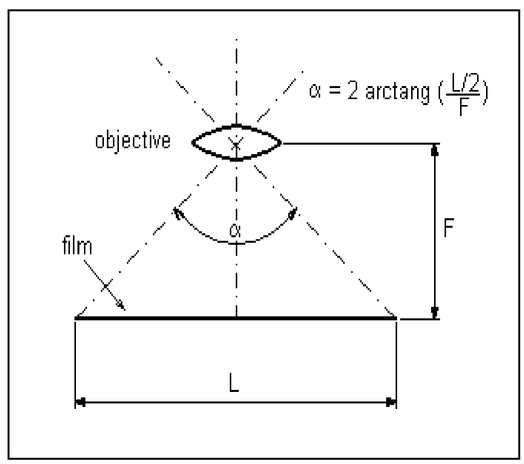

Figure 2. Angle of Vision

Once the angle of vision identified then using the height metric of object a simple trigonometric function evaluates the distance of object from the observer. The wide range of projections supported by digital camera softwares enumerates several geometrical metrics for a scene. These metrics are highly helpful for image processing. Table 1 refers to some of widely used image projections in digital image processing.

Table 1. Image Projection Schemes

Projection	Description
Axonometric	Projections along planes with viewing angle calibration. Isometric, Dimetric and Trimetric are widely used projections.
Oblique	The true parameters are applied for image projections binding to planes. Cavalier, Cabinet and Military projections are types under this category.
Perspective	The vision of eye based projection used to view a 3D object in different angles in real world. Enumerates the geometrical, distance metrics of objects in a scene effectively.

3. SPORT SYSTEM

3.1 Mobile phone module Integration

The primary requirement for SPORT system is the interlacing of digital camera, Selfie processing system and GPS system. Each sub system co-operatively supported with another sub system to build SPORT system. The functionalities supported by each sub system are shown in Table2.

Table 2. SPORT Sub-Systems

Sub System	Functional roles
Digital Camera	Image Capturing Image Adjustment Image Calibration
Selfie Processor	Geometrical metrics 3D model generation
GPS Service	Server Interfacing Global Position Estimation Multi- View Image perception Real Time metrics analysis

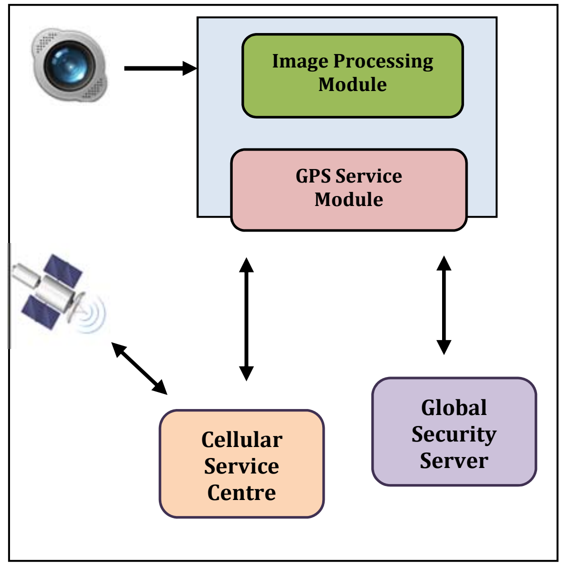

Figure 3. SPORTS Modules Integration

3.2 SPORTS Algorithm

SPORTS *Algorithm*:

Step 1:	Initiate Image Processing Module on the image data snapped by front camera.
Step 2:	Turn Image into layers (front, back). Identify details of front layer and back layer separately.
Step 3:	Construct a new image '*I*' by filtering front layer from back layer. Identify the missing values portion of background image (*I*) as '*i*' a sub image of '*I*'.
Step 4:	Apply Linear and Non-Linear filters to fill the missed region '*i*' using filling algorithms.
Step 5:	Reconstruct entire Background image '*I* ' which is the testing data 'T'.
Step 6:	Accept 'T' as input to GPS engine CALL **enum_building** (T: Image data) function.
Step 7:	Accept return values (V_Angle, B_Height) where V_Angle is viewing angle and B_Height is actual building height from GPS procedure call.
Step 8:	Let average Selfie snap distance ω=13.5 inch (0.3429 m).
Step 9:	Apply $Sin(i) = \frac{AB}{AC}; AC = AC + \sim$

	where AB=Landmark Height; AC= distance from Landmark; Θ =Viewing Angle.
Step 10:	Forward SMS with details of roamer location from identified landmark to security server. <Roamer_ID> is probably <AC> meters away from <LM_ID>[snap_time_stamp]

Enum_Building (T: Image data) Algorithm

Step 1:	Open database handler to global buildings image_list database
Step 2:	Load T into frame memory Adjust it into 3D virtual surface geometrical area relatively equal to original landscape projections snapped by satellites
Step 3:	Estimate the difference factors between T and O(original landscape 3D image $((\int_{h=0}^{n} T_h - \int_{h=0}^{n} O_h), (\int_{w=0}^{n} T_w - \int_{w=0}^{n} O_w), (\int_{Va=0^\circ}^{90^\circ} T_{Va}))$
Step 4:	Adjust the 3D scene of ‘O’ to the viewing angle of scene ‘T’.
Step 5:	Enumerate the building height based on modified 3D scene of ‘O’.
Step 6:	Enumerate view angle and building height relative to difference factor D_F View_Angle ← View_Angle ∞ D_F Building_Height←Building_Height ∞ D_F
Step 7:	Return (View_Angle, Building_height)

4. RESULT ANALYSIS

For training data four buildings are captured through Selfie images. The SPORT process applied to identify the distance of building from the observer location. Below figure series (3 to 7) represent the experimental processing outputs for SPORTS system. The real world training data considered for this work as training data. The Selfies of Charminar, Qutubminar, Lotus temple and Red Fort are processed by SPORTS.

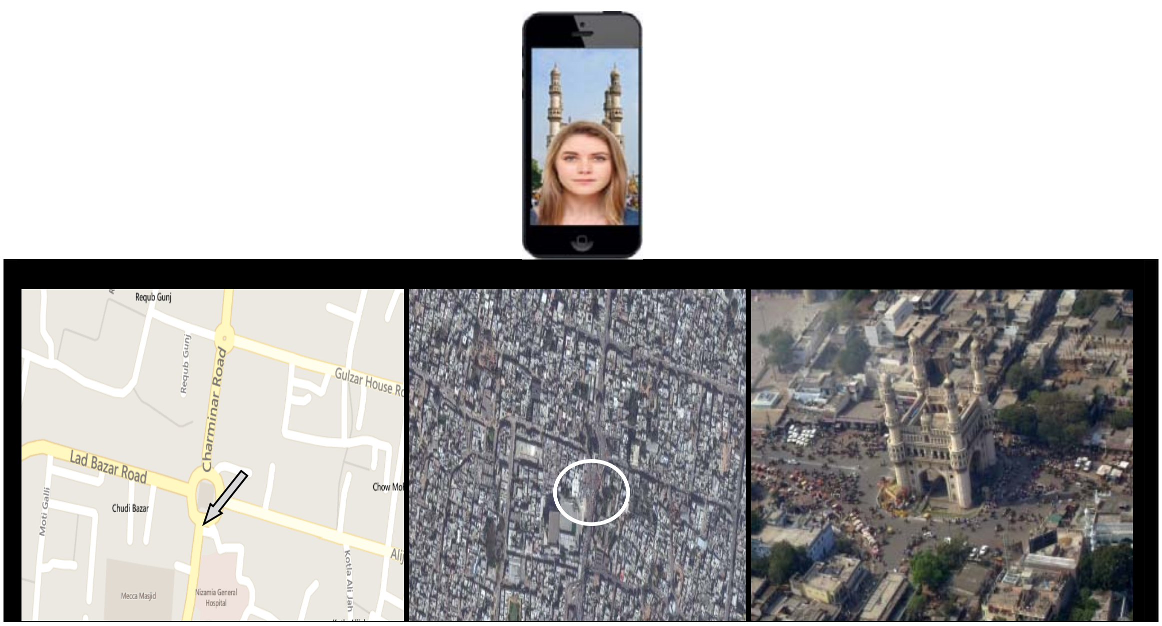

Figure 4. GPS Building Enumeration Process for Test Data-1

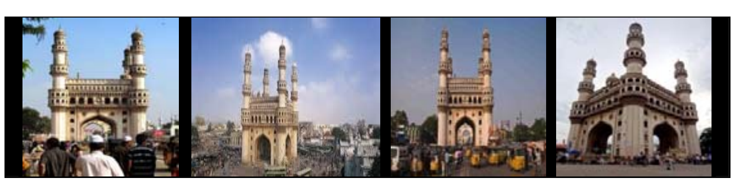

Figure 5. Estimating Viewing Angle from Multiple Views of Landmark (GPS Processing)

Figure 6. Estimating Viewing Angle from Multiple Views of Landmark (GPS Processing) Test Data 2

Figure 7. Estimating Viewing Angle from Multiple Views of Landmark (GPS Processing) Test Data-3

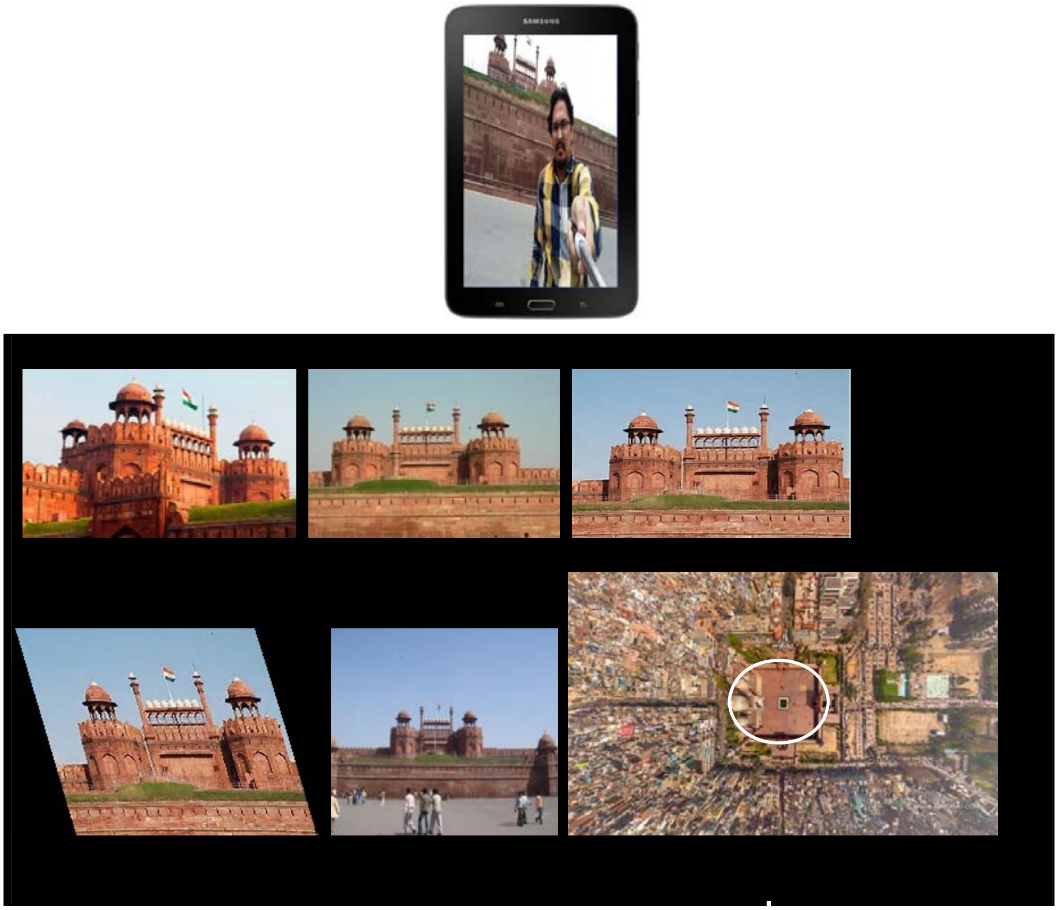

Figure 8. Estimating Viewing Angle from Multiple Views of Landmark (GPS Processing) Test Data-4

T1 (Charminar), T2 (Qtub Minar), T3 (Lotus Temple), T4 (Red Fort)

Table 3. Enumerated metrics for Selfie images (T1...T4)

Test Data	**View Angle**	**Building Height**	**Enumerated Value(Dist.)**	**Original Value (Dist.)**	**Error**
T1	65˚	56m	1.98 Km	1.91 Km	0.07
T2	76˚	73m	2.74 Km	2.69 Km	0.05
T3	89˚	34m	(359.9 m) 0.3599 Km	(358.5 m) 0.3585 Km	0.0010.04
T4	68°	48m	1.08Km	1.02	0.06

The results show the distance of focal lens from the monument captured by Selfie camera. Error rate ranges between 0.001 to 0.07 and which is insignificant in real world. SPORTS architecture resulted very close values to actual measurements. The accuracy of enumerated values highly depends on the GPS server real time image projection data. The best the projected image matched to 3D Selfie image projection gives the more accurate positioning of roamer that can be tracked. The processing time of SPORTS depends on the GPS Server real time image database maintenance and response to the local clients (mobile) selfie image acquisition process time.

Figure 8. Error Rate of Enumerated values

The above figure shows the error rate in distance measured, which is very low scale and substantiate SPORTS as a highly reliable procedure to track the roamer using Selfie images in real-time.

CONCLUSION

The proposed SPORTS model assists in tracking of roamer location from a smart phone selfie camera effectively with low error rate. The co-ordination among GPS-Server and SIP module with effective image manipulation tools is the vital mechanism for this model. If GPS-Server unable to locate the building information from real-time image databases a special mechanism needed to enumerate the current location of roamer by tracking the neighboring zones until a matched building identified from image database nearer to roamer local zone area. In future work this enhancement implementation is under process. For almost all objects identified by Image database by GPS Server SPORTS perform location identification with good accuracy. The model proposed in this paper process of tracking the location metrics of mobile users with a snap of selfie image.

REFERENCES

[1] S.Santhosh Kumar and K. Sudarshan, "Binocular Search Engine Using Android", International Journal of Engineering Inventions e-ISSN: 2278-7461, p-ISSN: 2319-6491, Volume 2, Issue 7 (May 2013) PP: 27-33.

[2] Mr. Nilesh Manganakar Mr. Nikhil Pawar Mr. P. Pulaskar, "Real Time Tracking of Complete Transport System Using GPS", Proceedings of Conference (NCNHIT)-2013.

[3] Qi Shany, Changchang Wu, Brian Curlessy, Yasutaka Furukawa, Carlos Hernandez & Steven M. Seitzy, "Accurate Geo-registration by Ground-to-Aerial Image Matching", Google Internship work, 2012.

[4] Xiaobin Xu, Tao Mei, Wenjun Zeng, Nenghai Yu, Jiebo Luo,"AMIGO: Accurate Mobile Image Geotagging", ICIMCS-Conference, Wuhan, Hubei, China-2012.

[5] David Marimon, Tomasz Adamek,,Arturo Bonnin & Tomasz Trzcinski, "Enhancing global positioning by image recognition", Telefonica Research and Development Barcelona, Spain-2012.

[6] Ruchika Gupta and BVR Reddy, "GPS and GPRS Based Cost Effective Human Tracking System Using Mobile Phones", View Point publication, Volume 2, No. 1,January-2011

[7] Roger Grosse & Matthew Johnson, "Matching a photograph to satellite images", MIT, CSAIL & LIDS-Project, California-2011.

[8] C.Peterson and M.Ludtke, "Determining Building Location Based on an Image", University Press, Wisconsin Madison University-2008.

[9] Alison Brown, Jacob Griesbach & Bruce Bockius" GPS TRACKING LOCATION-BASED SERVICE USING WRISTWATCH GEOZIGBEE SENSORS", Proceedings of ION NTM 2007, San Diego, CA, January 2007.

[10] Juho Kannala and Sami S. Brandt, "A Generic Camera Model and Calibration Method for Conventional, Wide-Angle, and Fish-Eye Lenses", OPTICS-Conference, 2007.

[11] Smart Tracking Systems using Handheld devices, article, Google Books.

[12] http://www.wikipedia.com/InstaGram services. html

[13] http://www.wikipedia.com/GPRSservices. html

[14] https://www.nmea.org/content/about_the_nmea/GPS_Technology