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Matching Characteristics of Two-Dimensional Images in Order to Determine the Three-Dimensional Position from Them for Robots

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ABSTRACT

The basic idea used in this thesis is use of natural features as the environmental symptoms for positioning. There are four basic steps for positioning. The first step involves the extraction of natural features contained in the scene as environmental symptoms, the second step is finding correspondence between the found features in the database images and the acquired image by the robot, the third step is finding accordance by using number of found corresponding and the final stage is Robot positioning by using of found correspondences in the discussed scene. Performed innovation in this thesis is related to steps two and three that we will attempt to amendment and eliminate the correspondences with different methods after finding an initial correspondence. Three methods will be discussed at this stage which will be fully described. Finally, the study shows that the proposed method has strong points such as, independence on parameters of the SIFT operator or the ability to images with little correct correspondences which ultimately will increase the efficiency of the technique and improve program output.

KEYWORDS: Finding Feature - Image Processing - Matching - Describe the characteristics - Site Recognition - Modeling and Simulation.

1. INTRODUCTION

Development and improvement of image processing methods led to the widespread use of these systems in many applications so that, different devices using image processing techniques, such as a simple camera photography has the power to detect movement of the eyelids and smiling to industrial robots used in industry. In the navigator of robots, understanding the environment is one of the most important parts of the problem because the robot want moves in unknown environments and to move and carry out his mission must achieve the necessary information by using of sensors about the location and position of obstacles. Therefore, in most applications, the position of the robot and the environment are unknown, the robot must be able to determine its position relative to its surroundings that can act according to its own automatic navigation. Hence, increasing the accuracy and speed of navigation is one of the important objectives of different researches. Most robots using ultrasonic or laser sensors to obtain necessary information about the location and position of obstacles. One of the problems that exist in robots navigation is that if the robot placed at a random unknown point of his working environment or wants to start from that point his position is not known and in most cases, his navigation algorithm will have trouble coming. Thus, the essential prerequisite for robots navigation is determine the correct location of a robot at the beginning and during the job. In the general case, the information cannot be achieved by using an image in the case of the three-dimensional components position but it can achieve the necessary information by using several images taken from different angles of the environment.

The map is mapping the one to one real world in robot domestic language. In navigation using the sensors such as laser sensors and optical cameras based on machine vision, so can extract the visual characteristics by them from surroundings and processing and analyzing them. Also, this may be done by acoustic sensors that visualize the image by using sound detectors this means that realizes the existence of obstacles and its distance from robot and their shape by sending a sound wave to the environment and receive it (Such as an ultrasound machine). However, in most cases acoustic detectors are used complementarily with optical cameras. Robots that need a map to run their navigational algorithm can work with one of the variety of topological and metric maps. Metric plan is quantitative and fairly detailed map that located the components of workplace based on latitude and longitude or as sizes relative to an particular origin in it. Using latitude and longitude for navigation by using of global positioning system such as GPS are faced with challenge because of the weak satellite signals in indoor environments but, it can be used in outdoor environments. Maps that their one place has certain length and width of a origin can
be considered as CAD or maps with occupied cells by obstacles. But the topological map is a qualitative plan that usually places determine by Nod and paths by specific lines.

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Navigation is the ability of the robot to detect its position according to the authority that holds which by using it can determine his way to the target. For this purpose, robot or any other mobile device require an environmental map that must interpret it and update it if necessary. This map or put at the disposal of robot in the beginning or the robot build it itself. Also, robot navigation systems classified into two general categories: map-based navigation and mapless navigation.

2- Statement of the problem

2-1- Chapter One:

2-1-1- Navigation based on image processing

In the automatic navigation robot must determine its location automatically and pass the way to its destination using the available information and maps. There are various methods that can noted to navigation based on visual information and its processing.

Positioning and navigation of robots have several algorithms based on the image data that the main components of each of these techniques include:

- Display area
- Sense of Models
- Positioning algorithms

Positioning based on vision includes the following steps:

- Obtaining image data by one of the variety of sensors
- Discover the environmental symptoms of current image (edges, corners, objects borders, etc.)
- Correspondence between the observed environmental symptoms with stored symptoms according to the desired rules
- Calculate the exact position

Positioning types include the following:

o Accuracy positioning: Which is determined by the position of the robot.

o Incremental positioning: The initial position of the robot is clear approximately and the objective is correct the location coordinates by use of images that the robot will be collect during the activity.

o Landmark tracking : Robot in the field of received images chasing environmental symptoms, such as plaque, specific bands, barcode, etc. which can be natural or artificial. The robot's position in this case is not completely accurateand follow the Gaussian distribution. The advantages of artificial than natural landmarks can mention to simplifies the detection algorithm and the diminish of process load and its high accuracy but its flaw is that if these symptoms not be present, transform or somehow not be in the sight of the robot, diagnosis will have trouble but the natural signals have more stables and a lot of it is available in the image scene.

But the robot navigation combines of the following four themes:

1. Scene Recognition
2. Localization of the robot
3. Route design
4. Interpretation of the given map, or the construction and interpretation of a map

According to the mentioned subjects, it comes clear that the positioning is one of the stages and in other words is prerequisite of navigation.

Vision-based navigation classified into two major navigation indoor and outdoor environments. This overall classification is divided into the following sections.

2-1-2- Indoor navigation

Indoor navigation divided into three categories: 1. Map based 2. Based on map building and 3. Mapless which will explain each of them in this chapter.

2-1-2-1- Map based navigation

A map based navigation robot need information on a metric or topological map that should save in its memory elements before starting the working of robot. In other words, robot workspace is known in the form of qualitative or quantitative by manufacturer of its program. It is clear that in this method, navigation will be in trouble if the robot's workplace change.

2-1-2-2- Map building navigation

In this model, environment map is not available in robot at first and the robot or build the map navigation simultaneously or in a separate phase surfing at work build the map initially and then perform navigation. Hence, navigation process beginning with robot's search in the environment surrounding and save images.

2-1-2-3- Mapless navigation

Mapless navigation includes all navigation solutions that does not need to information of the environment surrounding and robot motion depends to the elements that sees in environment such as, walls, furniture, doors, tables, etc. The advantage of this method is that if the robot start in the unknown environment its navigation has no problem and achieve greater flexibility in which, two methods are using such as, light flux and Landmark based navigation in order to the navigation.

A] Using the optical flux: In this method moving of objects or landmark tracking are estimate in a series of images. Its application is more in robot navigation in places with sides and parallel walls such as hallways. This is how it works that the distance from walls will estimate by comparing the two sides image and flow rate of characteristics or objects and thus, can navigate the robot in the center aisle. The disadvantage of this method is that the wall of hallway mast has texture so can extract the landmark tracking of that.

B] Implemented by using of landmark based navigation: In this technique, at first, a series of picture or template saved from environment and using them as robot's decision making pattern in the later stages. In other words, robot perform to navigation by using of frames that currently sees and its correspondence with his own stored pattern. Basically, this strategy is focus on how to memorize pictures.

2-1-3- Outdoor navigation

Navigation in outdoor environments has a same application to navigation in indoor environments in terms of finding landmarks, avoid collisions with obstacles, create map and update it and position estimation. External environments classified into two categories: structured by human and unstructured. In structured environments can use, for example, of roadways, pipes, cables and other objects as landmarks which can be found in abundance due to the high lines and borders but there is no regulation landmarks in unstructured environments and can use, for example, of peaks' lines, sun and such items as landmarks and basically, characteristics are in the form of areas and contours, hence, usually the robot that has the ability to function in a natural outdoor environment it also has the ability to work in indoor environment, in other words, for a robot that can perform his own navigation automatically, in summary, must be able to perform the following steps:

- Be able to identify the his scene placement at any moment.
- Be able to specify his exact position at that scene.
- Be able to perform his own defined mission in a given environment by using of the map that defined for that or a map that provides itself.

2-1-4- Processes related to identify the location of the robot

Scene detection problem, is pattern recognition problem. In fact, the location, is a three-dimensional scene that will be identify which is located into exposed to different lightings or state and different angles. Input a location detection system can has different modes like the following:

- A single two-dimensional image
- Two-dimensional stereo images (two or more images)
- Three-dimensional laser scans

Input image can even be a sequence of image that is the kind of video images sequence. In this case, can obtain higher accuracy of diagnosis. Position detection system usually consists of three classes. These steps include:

- Pre-processing scene (scene setting, normalization, light correction, etc.)
- Feature extraction
- Features adaptation

The purpose of the pre-processing stage is normalizing the scene images which in terms of lighting or the placement and other items of this type are not proper to process. Perform this stage play a effective role in the accurate extraction of scene video features.

In the feature extraction stage the purpose is extracting a set of distinguish photo metric or geometric features from image of a scene than can named existing methods for feature extraction, such as principal component analysis methods (PCA), analysis of the Fisher linear analysis (FLDA), scale invariant feature transform method (SIFT) and locality preserving projections (LPP) .

In the feature matching, the resulting feature vector from feature extraction will adap with classes of scene images in the images database. Matching algorithms are very diverse. From their most obvious place in these categories of algorithms, such as the nearest neighbor to advanced techniques like neural networks.

2-1-5- Scene detection and localization challenges

Scene recognition systems always are faced challenges in accurate diagnosis which these challenges puts great impact in accuracy and efficiency of the detection system.

2-1-5-1- Position track

In this type of positioning robot moves with the help of perceptual information from enviroment and must can reform the small errors of telemetry, which will vast increasingly. Usually, creator of this problem is uncertainty in determining the position of the robot. To solve this problem using the one-exponential estimate such as the Kalman filter, can be a good option. Also, the visual odometery has a similar function so that, robot motion will extract of visual information .

2-1-5-2- Global localization

In this case, initial position of the robot is unknown and the robot cannot determines that where located in the map currently. Hence, the algorithm must has Ability to recognize possible various situations.

2-1-5-3- Variability in the scene environment

The image of a scene, influenced by several factors can find large differences, such as components arrangement, placement mode, scene lighting and also, Diaphragm effects such as, the opening and closing speed, or lens aberration. Apply some restrictions and create special conditions in receiving of visual information can remove many of these differences as image pre-processing methods remove some of the effects caused by the environment. In the case of occurred changes in different images from a scene make a difference so much that create a difference over the difference between two images from two different scenes, if a computer diagnostics can perform must receive extensive data from two-dimensional images. In these cases, precision laser scanners can be use but these methods are out of this thesis.

2-1-5-4- Analysis in the space of image

When we pay attention to the image data of a scene, generally scene recognition referring to analysis in one sub-space who belong to different image spaces. This subject is explainable by taking a picture of this image is totally consists of 1024 pixels T that can provide a wide range of images. Considering only 8 bits per pixel for lighting, this image can create many different images that is exactly. Thus, from this perspective, there can be many additional information to provide a true picture. Hence, it must exist the possibility of reducing space of input image to obtain smaller sub-space. The purpose of this obtained subspace, is noise removal and information redundancy of an image to protect scene separator information. Nevertheless, the diversity of a scene that can be created, can be strongly non-linear which makes it difficult to separate.

2-1-6- Suggested algorithm

In this thesis, the purpose is using previously proposed optimal results in the field of robot positioning and presenting strategies to optimize them. For this purpose, the process can be divided into four categories. In the first and most important step first, we attempt to extract features from the image which as far as possible have good resistance to change image and also, we will try as much as possible the number of these points be high so, in the next steps have more choice. In second step, attempt to initial estimate between found points in different images. In this step we choose a number of candidate images for subsequent reviews. As a result, the number of found false correspondences are very high. The third step is consists of remove incorrect corresponding points. The forth step, that is the last step, is identify the exact position of the robot which by using of found signs in previous stages, attempt to find conversion between images and finally, estimates of rotation function and transfer images.

2-2- Chapter Two:

2-2-1- Mapless Navigation:

In this section, refer to a set of visual reactive techniques which have usage after the 90s. Usually reactive systems have not need to prior knowledge of the environment but to understand the environment, take appropriate decisions in navigation.

2-2-1-1- Systems based on light flux

Light flux is apparent motion of parameters in successive images. During navigation robot motion seems as background motion of picture sequential and appears fixed objects and parameters moving to the robot. For the extracting light flux through a video sequence must calculate size and direction of transition or rotational of scene and parameters moving in each pair of consecutive frames of the camera. Light flux will be displayed between two consecutive frames by a vector for each pixel that basis of which is depending on its speed and direction and show move of one pixel in sequential images. In some cases, running time and provided computing resources can optimized by initial extraction of image important features such as corners and edges. And then, light flux calculate for these parameters. Also, the range of an object appeared as zone with enough light flux and thus, considered as zone that must to avoid collision with that. The problem of methods based on light flux is that light reflection and jog on the floor or existence of floors tissue as areas where light flux has, will cause consider as as a barrier so, will cause error.

2-2-1-2- Navigation based on symptoms signs

Strategy based on symptoms signs consist of two processes. At first, phase of training in which images or characteristics of environment index will be record as an example. Models labeling with real positioning information or with a control command directs its affiliates. In second stage, that is the navigation stage, the robot must recognize environment and positioning by adaptation of online existing images with stored samples automatically. The real problem of strategy based on symptoms signs is ending the appropriate algorithm in order to make environment display and terms of online matching. The difference between the way that might be exist in the training and navigation phase leading to set of different images for each case, and so, will make difference in environment understanding. Hence, many researchers have been focused on improve the ways of learning images capture method and compliance method. There is two general ways to environment diagnosis without using of map:

- Model-based solutions: which is using of preset objects model in order to identify the characteristics of the environment and automatic positioning in it.
- Vision-based guidelines: parameters will not extract from pre-recorded images and automatic positioning will perform by image matching algorithms.

Zhou in order to describe the pre-recorded images used of histogram. Histograms of color, gradient, edge density and texture extracted from images and will store in histogram multidimensional database. Scene recognition perform by multidimensional histogram matching of the current image with samples were stored in a multi-dimensional histogram. Working with the histograms has two advantages:

1. Savings in computational resources
2. Easier and faster than the dependence of image processing

Bronstin and Corn provided one of the first navigation strategies and avoiding obstacle for mobile robots according to the making networks and using potential fields. Romazlis used of the concept of potential fields which combined with navigation method based on symptoms signs. This system differentiate in the navigation strategies based on typical image in the method which perform the navigation. This method defined an opposite database so that, shows a series of views which made as offline all the navigational environment. When a navigational mission is defined, will extract a series of corresponding images with what the robot camera sees while moving from image database. Robot motion is cause of online finding and matching process between models in the understanding fields and scene. Robot will chase the previously recognized listed features for navigation. Morita and others provided a new strategy for positioning based on symptoms signs for navigation in the external environment. They developed SVM Algorithm using images with Panorama. SVM positioning process consists of two steps:

- Learning, character or object recognition and classification
- Learning scene situations based on the characteristics that have already been classified.

The authors showed that how panorama images improves learning, adaptation and positioning, significantly. Because scenes have less dependent to change the path of the robot.

2-2-1-3- Navigation by using extracting image quality characteristics

There are two main species of collision obstacle avoidance based on sight:

- Model-based systems which need to predetermined models known objects.
- Collision obstacle avoidance systems based on sensor which processing the sensors online information to detect presence or absence of an obstacle.

These strategies can be known as quality navigation. Reactive Systems based on qualitative data avoid obstacles as much as possible. So that, calculating the precise numerical information, such as distances, the coordinates of the location or time interval of obstacles. In the general case, a coordinate system based on behavior is require management all image quality information and the corresponding reactions. This type of navigation systems have heavy dependence on unprocessed sensor information which will cause from change the shooting conditions that consists of brightness, light premises resources, shine of scene material, etc. Similarly, it is to applications in the external environment depending on time condition, weather, and season. Lurijo, in 1997, provided one of the initial solutions to solve these problems, which has lower image resolution and used in natural environments. Innovation of this method is a simple module structure which find the objects by using of black and white strictly information, RGB and HSV color. In this method, which there is no endpoint or designed mission for robot, the goal is the safe navigation. In this method, is assumed that all objects are on flat ground, hence, distant objects are locate at top of the image and closer objects are locate in the bottom of the image. Apart from these three modules witch focused on black and white, RGB and HSV, there is also a fourth module that extract the results of the other three modules to determine the range of objects simultaneously. Afterwards, these information will use in order to make the motor commands. In some reaction ways might be use of a combination of a camera and sensors such as laser or sonic in order to improve safety and navigation process capability. For example, CERES is an architecture based on behavior which that combined seven receiver ultrasonic transmitters with a black and white camera. Vision module in order to extract edges from images benefit through a canny filter. Edges identifies obstacles clearer. However, drawback of this method is that, because of the author's foam test environment covered with carpet made the edges which was mistaken with obstacle. This system converts the existence of distances over photos to the actual distances using a camera calibration algorithm. In this case, the author found that one-fifth below of the corresponding image is at least 20 cm and the remaining four-fifths of the corresponding is 26 cm of image. Similarly, edges that are located in one-fifth below picture must consider as obstacle and be avoided while, the remaining edges of the image can be consider so away which will consider later. Also, acoustic sensor used in order to keep away from the walls. Other researchers preferred to use segmentation techniques in order to differentiate the floor with obstacles. Finding the floor working environment determines that where is the blank range which there is mobility.

2-2-1-4- Techniques based on the pursuit of symptoms

Techniques for tracking moving elements (corners, lines, objects or specific areas) evolving in a series of video for various applications of image processing. Track is divided into two parts:

- Motion detection: this means the parameter, that must chasing, given to robot and robot must chasing a location in image in successive frames that this parameter exist in it.
- Specification compliance: adapt this lanmark with what has already steadily.

In the general case, navigation solutions based on pursuit of landmarks are not consists of obstacle avoidance module. But the work done by other devices and various authors have claimed that in navigation process the optimal relationship between these two has been established. Some writers and researchers have done their researches based on chase and finding the space of ground in sequential images and have attempted to guide the robot in vacant land in front.

Piers and Lig used homography in order to chase smooth corners of the ground in indoor environment and named it chaser navigation algorithm according to H. Other writers developed their work, the use of homography, in order to calculate the height of the chased features and obstacles on the ground during navigation. Accuracy of navigation strategies became important when the speed will increase at space travel, this means that must reducing processing time and tracking process will be accurate. Olro coined a pursuing images strategy in which the matrix of homography is made at first, and used it to compensate for the motion of unmanned space vehicles and finding objects. This system improved his previous work with a successful track and reduce the number of attempts. In recent works, the authors have preferred that combine the concept of pursuing features by constructing a three-dimensional environment. From stereo vision used for navigation in indoor and outdoor natural environments. This system that is finder of obstacle is newer, more accurate and faster than before its methods. Found features have a three-dimensional position and their chasing perform by measurements of the dependence and normalized root mean difference. In order to estimate the position with higher reliability, in the external environments, another way is that received information from the GPS combined with machine vision information. For example, Saripaly and Sukhtameh used pursuing feature algorithm with positioning by GPS in order to their robot navigation which was a helicopter called AVATAR. The method of Scale Invariant Feature Transform was invented by

Laveh. This method head out among the techniques to explore specific areas of the image and nowadays, it becomes a general method in applications of finding environmental signs. SIFT-based methods extract features that unchangeable to scale, rotation and lighting or changes of the point of view of the camera. When the navigation is performing, robot will receive unchangeable features from different parts of the scene, distances, angles and under different lighting. And therefore, obtain appropriate environmental signs to pursue and overall positioning. Several techniques have been developed for underwater environments. Some of them have general applications, such as images tessellating techniques and some methods are application-oriented, such as pursuing cable or pipe systems. Sea floor mosaic using According to the features detection and their pursuit of tissue-based operators and processes related to the dependence and allow to robot that positioning automatically and to determine the motion model. Chasing pipe and other lines is one of the essential cases for maintenance of thousands of kilometers of lines or power transmission between islands, countries and continents. Especially, not buried cables can be chasing by video techniques. First guidelines of the cable chasing were based edge detector and the Hough transform. But their weakness was that not able simultaneously chasing cable with the video rate. Grove propose a system that produce groups of different textures and segmentation the images to different areas that tissue behavior is same in them to pursue cables or pipes. Fresti and Gentile used a powerful nervous system to detect underwater objects. Balasuria and Yura improved the existing systems with the possibility of lose cable solution with the predict of hypothetical point position was combined with two-dimensional cable models. Chasing strategies based on vision was a fascinating branch of research in moving targets. In particular, in order to finding fish in shallow waters and techniques in the pursuit of military movable targets. In 2001, solution was introduced be Fan and Balasoria that was two-stage process in parallel as follows:

- Calculate the velocity of the object through the optical flux
- Positioning of moving objects by adopting techniques

Compute the camera motion is considered as a complex and challenging problem in underwater natural environments which there is not pipe or cable to chase or in other words positioning in the environment that there is not be defined references for robot. In these cases, must extract and chase references in the definition images.

Algorithms based on optical flux and chasing features will have problems because of scattering of effects and poor quality images due to low light of deep waters, but Gradient methods using of stage properties such as depth interval, shapes or light intensity that are more efficient and more accurate in terms of computation.

In a method, there is provided a hierarchy to determine the position of the robot using of omnidirectional images. In this method, in omnidirectional images vertical lines characterized radially by using of color descriptors. By using of hierarchical property can processed large database easily. This means that, dissimilar images will be rejected by using of three filters but, features increases with the square instead of increases linearly. Can perform the positioning by using one-dimensional three radius and a powerful matching model, such as RANSAC when found at least five matching lines just between image samples (tested) and two images in the database. This method will examine by two image database and good results can be achieved in the topological and metric positioning.

A SLAM system is offered which is only work base on appearance signs. And build the first appearance graph from a set of all the way training images which collected during the search. Laveh found the image properties by using of difference of Gaussian (DOG) in order to accommodate the images and used of scale invariant feature transform (SIFT).

Many articles have been examined the various aspects of stereo vision that of these articles can use of three cameras which arranged in a specific arrangement and obtained depth maps with 2HZ frequency. In this article used of algorithms based on zone for processing images.

In this article used of feature-based methods to obtain the depth map of indoor images. The method presented in this paper is that at first, obtained line segments in two images and then, used of matching between the lines which the presented results are in the level of finding corresponding to each line segment and the information is not provided about the ground map.

In this article, have been used of two images for navigation in the context of information. Ground surface is considered contains level with obstacles and unhindered which the designed robot is able to processing these images.

Authors have been provided a method for robot positioning in outdoor environment using spherical images which recorded by cameras with high resolution. After that, to matching between images have used of method of recording powerful features from up (U-SURF) that is stable with respect to rotation and used of 4-point algorithm to calculate the necessary matrix. In this experiment, the authors found that the use performance of feature zone is similar provided DOG areas with SIFT with the exception that, is more efficient computationally. In this method, to reduce the computational cost of comparing the new image with each images in robot's memory, to classify the rooms or areas that have similar appearance, was performed incremental spectral clustering and a representative group of them can be found. Hence, an initial implementation phase will compare which displayed new picture with a group (representative). If there is not a clear match, tested image will compare with all the images related to categories.

A mobile robot equipped with an all the way camera can determine robot position by collected image information of walls. But with increasing distance with respect to the property, positioning error will be high. Offered an adaptive omnidirectional vision system which use a combination of a convex mirror, wide angle lens and a conventional camera. Which use of it will describe in the following. Usually, adaptive omnidirectional vision systems are formed a combination of a convex mirror which can be in the form of butter, share, cone, or hyperbolic and including a camera which receive reflected rays from the mirror. L1 is representative rays of light that reflected of walls to mirror and then to camera but, L2 is representative rays of light that reflected from the body of the robot and camera to mirrors and then to the camera. Hence, a picture will form with 360 degrees which is located in the center of the robot and camera photos which is useless for scene detection and positioning. In other words, the body of the robot and camera on it, hidden part of the scene which is useful for diagnosis. But authors proposed that can improve this system by creating a hole in the convex mirror and embedded a wide-angle lens in it which we can have image from the ceiling s with a 360 degree view simultaneously. This act will cause, in addition to the features of the walls and floor, having features from roof which this matter help to better identify. But the problem that exists is that rays of light that passes through a wide angle lens has been distorted and causes create distorted image in camera which authors solved this problem by obtaining the parameters and camera calibration pattern and using the least square solution.

Recently, in the positioning of the robot used of particle filter successfully. Particle filter is based on sequential Monte Carlo approach so that, Posterior Density Function (PDF) will display by a set of samples (which called particles). Generally, the particle filter is needy a large number of samples for proper display of PDF changing situation with time but the large number of samples have direct relationship to the calculation size and cost. To overcome this problem is proposed a classical particle filter which have been improved by the addition of an EKF distribution and support vector regression (SVR). This algorithm has the ability working with a small set of samples. EFK increase the effect of sampling and collect the examples of good quality. SVR based on weighting will weigh the samples more precisely, again. As a result, the impact and number of samples prevent of the lack of samples as much as possible.

3- Conclusion

However, according to the given explanations will compare to these three algorithms.

As was observed, Geometric algorithms has provided better results in all thresholds and has better stability to changes. This represents a greater reliability of this method compared with other methods in the separation of the correct correspondence from incorrect correspondence. According to the given explanations, it is clear that in geometric method, more than 90 percent of the found correspondence are the correct correspondence. In next step, we will attempt to finding projective transformation using of the correspondences between images and using of this conversion we determine the rotate and move rate of robot.

REFERENCES

1. Bonin-Font, Francisco., Ortiz, Alberto. and Oliver, Gabriel. (2008) ‘Visual Navigation for Mobile Robots: A Survey’, J Intell Robot Syst, 53:263–296 Springer Science + Business Media B.V.
2. Ye-hu, Shen., Ji-lin, Liu. and Xin, Du. (April 2008) ‘Environment map building and localization for robot navigation based on image sequences’, Journal of Zhejiang University - Science A, Volume 9, Number 4.
3. Thrun, S., Beets, M., Bennewitz, M., Burgard, W., Creemers, A., Dellaert, F., Fox, D., Hahnel, D., Rosenberg, C., Roy, N., Schulte, J. and Schulz, D. (2000) ‘Probalistic algorithms and the interactive museum tour-guide robot minerva’, International Journal of Robotics Research, 19(11):972-999.
4. Scaramuzza, D. and Siegwart, R. (October 2008) ‘Appearance guided monocular omnidirectional visual odometry for outdoor ground vehicles’, IEEE Transactions on Robotics, Special Issue on visual SLAM. In press. Guest editor: Neira, Joe. Davison, Andrew. and Leonard, John J.
5. Turk, M. (December 2001) ‘A random walk through eigenspace’, IEICE Trans. Inf. & Syst.,E84-D(12):1586–1595.
6. Atiya, S. and Hager, G.D. (1993) ‘Real time vision-based robot localization’, IEEE Trans. Robot. Autom. 9(6), 785–800.
7. Christensen, H.I., Kirkeby, N.O., Kristensen, S. and Knudsen, L. (1994) ‘Model-driven vision for indoor navigation’, Robot. Auton. Syst. 12, 199–207.
8. Matthies, L. and Shafer, S.A. (1987) ‘Error modeling in stereo navigation’, IEEE J. Robot. Autom. 3(3), 239–248.
9. Kosaka, A. and Kak, A.C. (1992) ‘Fast vision-guided mobile robot navigation using model-based reasoning and prediction of uncertainties’, Comput. Vis. Graph. Image Underst. 56(3), 271–329.
10. Santos-Victor, J., Sandini, G., Curotto, F. and Garibaldi, S. (1993) ‘Divergence stereo for robot navigation learning from bees’, In: Proc. of IEEE Conference on Computer Vision and Pattern Recognition.
11. Ohno, T., Ohya, A. and Yuta, S. (1996) ‘Autonomous navigation for mobile robots referring pre-recorded image sequence’, In: Proc. of IEEE Int’l Conf. on Intelligent Robots and Systems (IROS), vol. 2, pp. 672–679.
12. Cornall, T. and Egan, G. (2003) ‘Optic Flow Methods Applied to Unmanned Air Vehicles’, Academic Research Forum, Department of Electrical and Computer Systems Engineering, Monash University.
13. Shi, J. and Tomasi, C. (1994) ‘Good features to track’, In: Proc. of IEEE Intl Conf. on Computer Vision and Pattern Recognition (CVPR), pp. 593–600.
14. Matsumoto, Y., Ikeda, K., Inaba, M. and Inoue, H. (1999) ‘Visual navigation using omnidirectional view sequence’, In: Proc. of IEEE Int’l Conf. on Intelligent Robots and Systems (IROS), pp. 317–322.

15. Zhou, C., Wei, Y. and Tan, T. (2003) 'Mobile robot self-localization based on global visual appearance features', In: Proc. of IEEE Int'l Conf. on Robotics and Automation (ICRA), pp. 1271–1276

16. Borenstein, J. and Koren, Y. (1989) 'Real-time obstacle avoidance for fast mobile robots', IEEE Trans. Syst. Man Cybern. 19(5), 1179–1187.

17. Remazeilles, A., Chaumette, F. and Gros, P. (2004) 'Robot motion control from a visual memory', In: Proc. of IEEE Int'l Conf. on Robotics and Automation (ICRA), pp. 4695–4700.

18. Morita, H. and Hild, M. (2006) 'Panoramic view-based navigation in outdoor environments based on support vector learning', In: Proc. of IEEE Int'l Conf. on Intelligent Robots and Systems (IROS), pp. 2302–2307.

19. Morita, H., Hild, M., Miura, J. and Shirai, Y. (2006) Panoramic view-based navigation in outdoor environments based on support vector learning. In Proc. of IEEE Int'l Conf. on Intelligent Robots and Systems (IROS), pp. 1885–1890.

20. Lorigo, L.M., Brooks, R.A. and Grimson, W.E. (1997) 'Visually-guided obstacle avoidance in unstructured environments', In: Proc. of IEEE Int'l Conf. on Intelligent Robots and Systems (IROS), pp. 373–379.

21. Chao, M.T., Braunl, T. and Zaknich, A. (1999) 'Visually-guided obstacle avoidance', In: Proc. of 6th Int'l Conf. on Neural Information Processing ICONIP, vol. 2, pp. 650–655.

22. Maja, J.M., Takahashi, T., Wang, Z.D. and Nakano, E. (2000) 'Real-time obstacle avoidance algorithm for visual navigation', In: Proc. of IEEE Int'l Conf. on Intelligent Robots and Systems (IROS), pp. 925–930.

23. Trucco, E. and Plakas, K. (2006) 'Video tracking : a concise survey', IEEE J. Ocean. Eng. 31(2), 520–529.

24. Pears, N. and Liang, B. (2001) 'Ground plane segmentation for mobile robot visual navigation', In: Proc. Of IEEE Int'l Conf. on Intelligent Robots and Systems (IROS), pp. 1513–1518.

25. Lowe, David G. (November 2004) 'Distinctive Image Features from Scale-Invariant Keypoints', International Journal of Computer Vision, Vol. 60, No. 2, pp. 91-110.

26. nabud tu shomareha

27. Ollero, A., Ferruz, J., Caballero, F., Hurtado, S. and Merino, L. (2004) 'Motion compensation and object detection for autonomous helicopter visual navigation in the COMETS system', In: Proc. Of IEEE Int'l Conf. on Robotics and Automation (ICRA), pp. 19–24

28. Ferruz, J. and Ollero, A. (2000) 'Real-time feature matching in image sequences for non-structured environments', Applications to vehicle guidance. J. Intell. Robot. Syst. 28, 85–123

29. Saeedi, P., Lawrence, P.D. and Lowe, D.G. (2006) 'Vision-based 3-D trajectory tracking for unknown environments', IEEE Trans. Robot. 22(1), 119–136.

30. Mejias, L.O., Saripalli, S., Sukhatme, G.S. and Cervera, P.C. (2005) 'Detection and tracking of external features in an urban environment using an autonomous helicopter', In: Proc. of IEEE Int'l Conf. on Robotics and Automation (ICRA), pp. 3972–3977.

31. Lowe, D.G. (1999) 'Object recognition from local scale invariant features', In: Proc. of International Conference on Computer Vision (ICCV), pp. 1150–1157.

32. nabud tu shomareha

33. Garcia, R., Cufi, X. and Pacheco, Ll. (2000) 'Image mosaicking for estimating the motion of an underwater vehicle', In: Proc. of 5th IFAC Conference on Manoeuvring and Control of Marine Craft (MCMC).

34. Hallset, J. (1996) 'Testing the robustness of an underwater vision system', In: Laplante, P., Stoyenko, A. (eds.) Real-Time Imaging: Theory, Techniques, and Applications. IEEE, pp. 225–260.

35. Matsumoto, S. and Ito, Y. (1995) 'Real-time based tracking of submarine cables for AUV/ROV', In: Proc. of IEEE Oceans, vol. 3, pp. 1997–2002.

36. Rives, P. and Borelly, J.J. (1997) 'Visual servoing techniques applied to an underwater vehicle', In: Proc. Of IEEE Int'l Conf. on Robotics and Automation (ICRA), pp. 20–25.

37. Grau, A., Climent, J. and Aranda, J. (1998) 'Real-time architecture for cable tracking using texture descriptors', In: Proc. of IEEE Oceans Conference, vol. 3, pp. 1496–1500.

38. Foresti, G.L. and Gentili, S. (2002) 'A hierarchical classification system for object recognition in underwater environments', IEEE J. Oceanic Eng. 1(27), 66–78.

39. Balasuriya, B. and Ura, T. (2001) 'Underwater cable following by twin-burger 2', In: Proc. of IEEE Int'l Conf. on Robotics and Automation (ICRA).

40. Fan, Y. and Balasuriya, B. (2001) 'Optical flow based speed estimation in auv target tracking', Proc. Of IEEE Oceans.

41. Dalgleish, F.R., Tetlow, S.W. and Allwood, R.L. (2004) 'Vision-based navigation of unmanned underwater vehicles: a survey. Part II: Vision based station keeping and positioning. Proc. Inst. Mar. Eng. Sci Technol. Part B, J. Mar. Design Oper. B(8), 13-19.

42. Murrillo, A., Sagűés, C., Guerreo, J., Goedemé, T., Tuyelaars, T. and Van Gool, L. (2007) From omnidirectional images to hierarchical localization. Robotics and Autonomous Systems 55(5):372-382.

43. Cummins, M. and Newman, P. (2007) 'Probabilistic appearance based navigation and loop closing', In: Proc. IEEE International Conference on Robotics and Automation (ICRA07), pp 2042-2048.

44. Booij, O., Terwijn, B., Zivkovicc, Z. and Krose, B. (2007) 'Navigation using an appearance based topological map', In: IEEE International Conference on Robotics and Automation (ICRA), pp 3927-3932.

45. Dalgleish, F.R., Tetlow, S.W. and Allwood, R.L. (2004) 'Vision-based navigation of unmanned underwater vehicles: a survey. Part II: Vision based station keeping and positioning. Proc. Inst. Mar. Eng. Sci Technol. Part B, J. Mar. Design Oper. B(8), 13-19.

46. Schmid, C. and Mohr, R. (May 1997) 'Local grayvalue invariants for image retrieval', IEEE Transactions on Pattern Analysis and Machine Intelligence, 19(5):530-534.

47. Bo Yin, Zhiqiang Wei, Yanping Cong, and Tao Xu A Novel Particle Filter Method for Mobile Robot Localization 2010 International Conference on Measuring Technology and Mechatronics Automation

48. Valgren, C. and Lilienthal, AJ. (2008) 'Incremental spectral clustering and seasons: Appearance-based localization in outdoor environments', In Proc. IEEE Int. Conf. on Robotics and Automation, pp 1856-1861.

49. Bay, H., Ess, A., Tuytelaars, T. and Gool, LV. (2008) 'Surf: Speeded up robust features', Computer Vision and Image Understanding (CVIU) 110(3):346-359

50. Minsoo, Goh., and Sangmin, Lee. (2010) 'Indoor Robot localization using Adaptive Omnidirectional Vision System', International Journal of Computer Science and Network Security(IJCSNS), VOL.10 No.4, April, pp 66-70.