iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH
IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 11 Issue: IV Month of publication: April 2023

DOI: https://doi.org/10.22214/ijraset.2023.48694

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 11 Issue IV Apr 2023- Available at www.ijraset.com

VR Based Remote Campus Tour

Payal Kadav[1], Wasimpasha Patwari[2], Ayush Kalme[3], Shreya Nigade[4], Dr. Deepak S. Uplaonkar[5]
[1, 2, 3, 4, 5]Computer Engineering International Institute Of Information Technology,Hinjewadi. Pune,India

Abstract: We recommend a system called "Virtual Tour of College Infrastructure" that gives a virtual college tour to visitors, such as students, parents, and guests. They may be interested in learning about the facilities and infrastructure offered by the college. For this, students must really travel to the college campus, which will take a lot of their time and effort and cost money for those who live far away. The suggested solution offers a virtual perspective of the infrastructure at the college in order to address this problem. This enables visitors access a certain department or lab from a distance. Additionally, it can be displayed at the College's main gate to assist visitors in finding a certain student, member of staff, or lab by outlining the precise route through the "Search" module. Virtual reality is essentially how this technology operates. Combining two or more photos to create an image panorama is the procedure. The method of producing an image panorama from a collection of photos with overlapped fields is known as image stitching. The process of stitching together photographs is difficult because of issues including noise-corrupted images, indexing a lot of images, high image resolution, parallax, and scene motion. Another difficulty is getting rid of seams that are noticeable. This work applied a feature-based automatic image stitching approach to obtain a broad seamless panorama.
Keywords: Image stitching , Virtual reality, SIFT, A* algorithm.

I. INTRODUCTION

Nowadays, practically every institution and organisation uses the Internet network to disseminate information to the general public. A web application technique that utilises the Internet network is a very suitable method for showcasing organisations' assets and encouraging the release of public information. The web application technique significantly improves businesses' capacity to communicate their strategies and other pertinent information to their key stakeholders. Rich content, including multimedia elements like text, audio, images, animation, and video, is supported by the web application. In reality, we can add interactive elements to web apps to make them more interesting and varied. The word "interactive" is frequently used to describe how two objects interact and influence one another. Therefore, it is important to deliver public information in a way that is engaging, thorough, and meaningful. It is thought to be particularly appropriate to assist the provision of fascinating public information by developing a web-based campus virtual tour 360-degree information system application. One application of virtual reality in contemporary education is campus visual navigation. For better administration, this application focuses on campus digitization and virtualization.In many fields, a large-view, high-resolution image is typically necessary. Currently, there are two primary methods for acquiring these images: the first involves fixing the camera's shaft and taking pictures as it pivots, and the second involves fixing the camera's light center, moving the lens horizontally, and taking pictures. It is required to learn image stitching techniques in order to combine these images into a wide-view, high-resolution image. The method of combining photos with overlapped sections to create an image with a broad field of view and high resolution is known as image stitching, also known as image mosaic. Typically, feature matching is used to determine the corresponding spots of the images for stitching when two photos with overlapped areas are supplied. To place the photos under the same coordinate system, image registration is done. Due to the possibility of various outside surroundings and camera settings (such exposure) at the time those photographs are captured, seam removal is used to remove the seam. Consequently, picture registration and seam removal are important image stitching approaches. The requirements for accuracy and time have been updated as a result of the development of new approaches. Numerous advancements in this sector have been made recently. For instance, optimal seam approaches create a more seamless transition between two images, while scale-invariant feature transform (SIFT) and speed-up robust feature (SURF) methods increase the precision of image registration to some extent.

II. RELATED WORK

A virtual tour is an interactive representation of a real-world site on the planet, typically made up of a textual narrative, still photographs, and panoramic views. The phrase "panorama" refers to an unbroken tour or view because a panorama is typically a collection of images the photographer or videographer took.These virtual tours were created using a vantage point, a set of panoramic photos. A virtual tour is essentially a computerised environment that digitally recreates well-known locations.

This technique gives consumers a unique impression that they are visiting the location in the future. Numerous academic and business applications make use of virtual environments. Virtual tour applications have been studied and are intended for a variety of uses. A project idea for a "Virtual tour at Tsinghua University" was put forth by Wu et al. Wu's study is presently restricted to the production of panoramic photographs, and user control and rotational functions are not offered.

In order to create an interactive virtual navigation application for developing and deploying a digital campus approach, Yang et al. proposed a workable concept and development environment. In-depth research is still required when taking this approach into account in real-time interactivity, particularly when significant amounts of data are involved. Manghisi suggested using gestures to navigate a display of a virtual tour application. In order to increase user engagement, this study also contrasts the current interface with a conventional mouse-controlled menu with the suggested gesture-based interface.

We can emphasise discrepancies between the research by using the ones we've stated that are related. To create 360-degree images We processed the stitched data using a very effective SIFT algorithm along with HTML, CSS, React.JS, VUE.JS, and Node.JS to create a 360-degree panoramic virtual tour. Therefore, in this case, we leverage tried-and-true performance algorithms and then integrate them into a virtual tour campus application that aims to highlight institutions' assets and promote the release of publicly available information.

III. SURVEY OF RECENT METHODS

Author Jimbo Lu et al.(2021) [1] Before image alignment author found that using CLHAE algorithm to enhance image contrast can increase the spared of matching points on the object in the low contrast images. To achieve more precise matching points author extracted feature points and matched them through SIFT algorithm firstly and then detected matching points by improved ZNCC algorithm.

Author C.Ravi et al.(2020) [6] stated that effective feature matching and detection methods including Speeded-Up Robust Features (SURF), Scale-Invariant Feature Transform (SIFT), features from Accelerated Segment Test (FAST), Euclidean distance, and Random Sample Consensus (RANSAC) uses for the stitching of images . When utilising RANSAC to match images, the FAST approach provides effective matching spots that improve the stitched image. Depending on the nature of the situation, a method is chosen and future work will involve stitching panoramas together using video instead of images

Zhaobin Wang et al.(2020) [8] mistrydescribed research on various image stitching approaches, such as seam removal, seam removal, and quality rating. They claim that SURF-based registration takes up less time than SIFT-based registration. With the use of point clouds, we may modify the matching and registration processes to take the depth dimension into account and can create image stitching for unique applications.

A. Candra et al.(2020) [11] states that Dijkstra's can handle the shortest path search with the best results in a longer search time as one variation of the greedy algorithm. The best-first search method A-Star, which can handle the shortest path search with a faster time but is not always optimal, contrasts with Dijkstra's. by comparing Dijkstra's with A-benefits Star's and drawbacks. Additionally, the authors contrast Dijkstra's and A-star based on Big-Theta () complexity and running time. There are instances where the routes generated by the two algorithms disagree, resulting in variations in the total distance generated. In this instance, it has been demonstrated that A-running Star's time is quicker than Dijkstra's. Dijkstra's is $\Theta(n2)$and A-Star is $\Theta(m*n)$, where $0 \leq m \leq n$.

Shreyas Mistry et al.(2016) [14]alexprovide a way for us to the complete process of stitching together images from camera-captured images using software on a computer. Image acquisition, image registration, and image mixing are the primary phases. The HARRIS corner detection technique is used throughout the image registration process to identify features. Outliers from the two photos will be removed using the RANSAC method.

Author Alex et al.(2020) introduced method of creating seamless panorama (feature based) using SIFT KNN and RANSAC. Method uses scale-invariant features Transform(SIFT) to extract features, KNN algorithm is used for feature matching and random-sample consensus to calculate homography. The algorithm needs improvement in robustness in stitching 3 or more images.

IV. METHODLOGY

A. System Design

In this research, the SIFT method is used to develop virtual tour 360 applications. Applications are created with a web environment running on the Internet network in mind.The Architecture of the system is shown in fig.1:

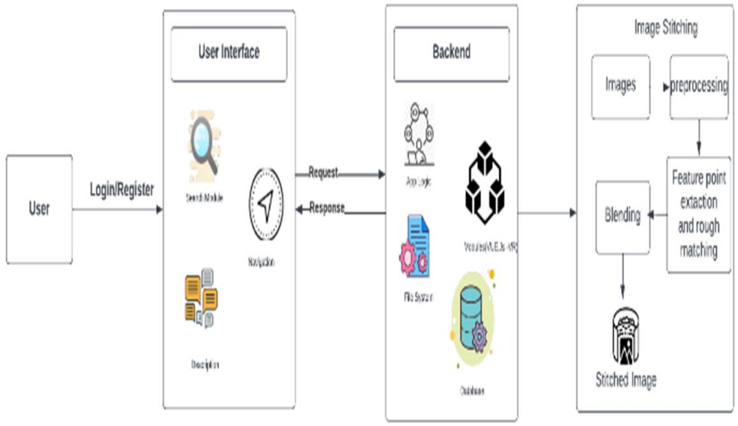


Fig.1. System Architecture

B. SIFT Algorithm

To implement feature extraction, SIFT was used. For SIFT algorithms, there are four fundamental steps: identification of scale-space extrema, localisation of keypoints, assignment of orientation keypoint descriptor, etc. Gaussian blurring is used to create an image pyramid from each image, and after that, neighbouring images are subtracted to create the Difference of Gaussian (DOG) pyramid. If the DOG is located, local extrema will be looked for in photos. A list of possible important sites is generated using extremea detection. Some of them, however, are unstable. Applying some restrictions will help to filter some points. If the intensity is below a specified threshold value, the first extrema are disregarded. The second is the removal of some edge-located points and low-contrast critical points. The keypoint orientation assignment comes next. Each key point will be given an orientation in this step based on the local image gradient directions that were used to generate the keypoint descriptors.

C. A* Algorithm

Using the current state of the map and other objects, pathfinding is used to decide how an object will move from one location to another. Finding the quickest route between a starting location and an ending point is done using a searching algorithm.It is a practical approach that is frequently applied to map traversal to determine the quickest route. To aid in the development of a robot that can navigate on its own, A* was initially developed as a graph traversal problem. It continues to be a very used approach for traversing graphs. Algorithms must be able to swiftly process and generate the shortest route to a destination placein order to solve the pathfinding problem. The A* algorithm is one of the pathfinding algorithms. Dijkstra's approach is improved by Algorithm A* by changing heuristic functions. The Dijkstra method's overall trajectory cost will be minimised by A*. At the right time, A* will offer the best option. When there is no blockage on the map and the case search path is straightforward, A* performs as quickly and effectively as Dijkstra. In the situation of a map containing a hitch, A* can locate a route without becoming stuck by an already present impediment.

D. Equations

Our technique moves the overlapping area inside the reference image using 1 image as a reference image. In order to calculate relativity, the second picture must move. Suppose I1 is the referrer and I2 is another image, the overlapped areas are known as Ω1 and Ω2, whose sizes are M ✕ N. The relativity R can be known as

$R = x = 1\ M \sum y = 1\ N \sum |\ \Omega1\ (x\ , y) - \Omega2\ (x, y)|$

The A* algorithm looks for the shortest route between the starting and ending places.

$f = g + h$

where g is the cost of moving and h is heuristic value. approximation heuristics - Manhattan distance –

It is nothing but the sum of absolute values of differences in the goal's x and y coordinates and the current cell's x and y coordinates respectively, i.e.

$h = abs\ (current\_position.\ x - goal.\ x) + abs\ (current\_position.\ y - goal.\ y)$

V. CONCLUSION

The proposed system provides an interactive tour around the institution, focusing on the computing division. A department or lab can be visited from a distance using this useful technology, which also shows a virtual map of the way to get there. To save time, it offers a virtual tour to all guests who wish to visit our university. An excellent level of matching can be achieved by using the picture stitching algorithm to create a high-quality panoramic image.

The application is more engaging than the actual site because to the motion feature's implementation. The audience will now have a new experience in finding the necessary information in a meaningful way because to the availability of different information content, including text, images, and dynamic panoramas.

VI. FUTURE SCOPE

The "VR Based Remote Campus Tour" web-based solution, which is only relevant to one college, enables the development of a uniform framework for varied infrastructure. Real-time viewing is possible because the system provides a static virtual view. We can develop virtual tours for all other colleges, as well as numerous other business and educational visits. Future improvements are needed to meet the project's constraints, such as upgrading the voice recognition to a paid plan to increase the service's level of assurance and enhance the user interface.

VII. ACKNOWLEDGMENT

We would like to express our special thanks of gratitude to our internal guide Dr. Deepak Uplaonkar as well as Dr. Ajitkumar Shitole, Head of Department who gave us the golden opportunity to do this project on the topic “VR based Remote Campus Tour” which also helped us in doing a lot of research and we came to know about so many new things. We are really grateful to them.

REFERENCES

[1] jimboLu, J., Huo, G. & Cheng, J. Research on image stitching method based on fuzzy inference. Multimed Tools Appl 81, 23991–24002 (2022). https://doi.org/10.1007/s11042-022-12748-9

[2] Feature-based Automatic Image Stitching Using SIFT, KNN and RANSAC. February 2020 International Journal of Advanced Trends in Computer Science and Engineering 9(1.1 S I):96-101 DOI:10.30534/ijatcse/2020/1891.12020

[3] Triyanna Widiyaningtyas, Didik Dwi Prasetya, Aji P. Wibawa, “Webbased Campus Virtual Tour Application using ORB Image Stitching”, 2018.

[4] Bui, V., Alaei, A. Virtual reality in training artificial intelligence-based systems: a case study of fall detection. Multimed Tools Appl 81, 32625–32642 (2022). https://doi.org/10.1007/s11042- 022-13080-y

[5] A. S. b. Azizo, F. b. Mohamed, C. V. Siang and M. I. M. Isham, "Virtual Reality 360 UTM Campus Tour with Voice Commands," 2020 6th International Conference on Interactive Digital Media (ICIDM), 2020, pp. 1-6, doi: 10.1109/ICIDM51048.2020.9339665.

[6] C. Ravi and R. M. Gowda, "Development of Image Stitching Using Feature Detection and Feature Matching Techniques," 2020 IEEE International Conference for Innovation in Technology (INOCON), 2020, pp. 1-7, doi: 10.1109/INOCON50539.2020.9298339.

[7] Kasim, S. et al. (2017). Indoor Navigation Using A* Algorithm. In: Herawan, T., Ghazali, R., Nawi, N.M., Deris, M.M. (eds) Recent Advances on Soft Computing and Data Mining. SCDM 2016. Advances in Intelligent Systems and Computing, vol 549. Springer, Cham. https://doi.org/10.1007/978-3-319-51281-5_60

[8] Wang, Z., Yang, Z. Review on image-stitching techniques. Multimedia Systems 26, 413–430 (2020). https://doi.org/10.1007/s00530-020-00651-y

[9] A. Rodrigues and J. F. P. Cheiran, "Virtual look around: interaction quality evaluation for virtual tour in multiple platforms," 2020 22nd Symposium on Virtual and Augmented Reality (SVR), 2020, pp. 47-56, doi: 10.1109/SVR51698.2020.00023.

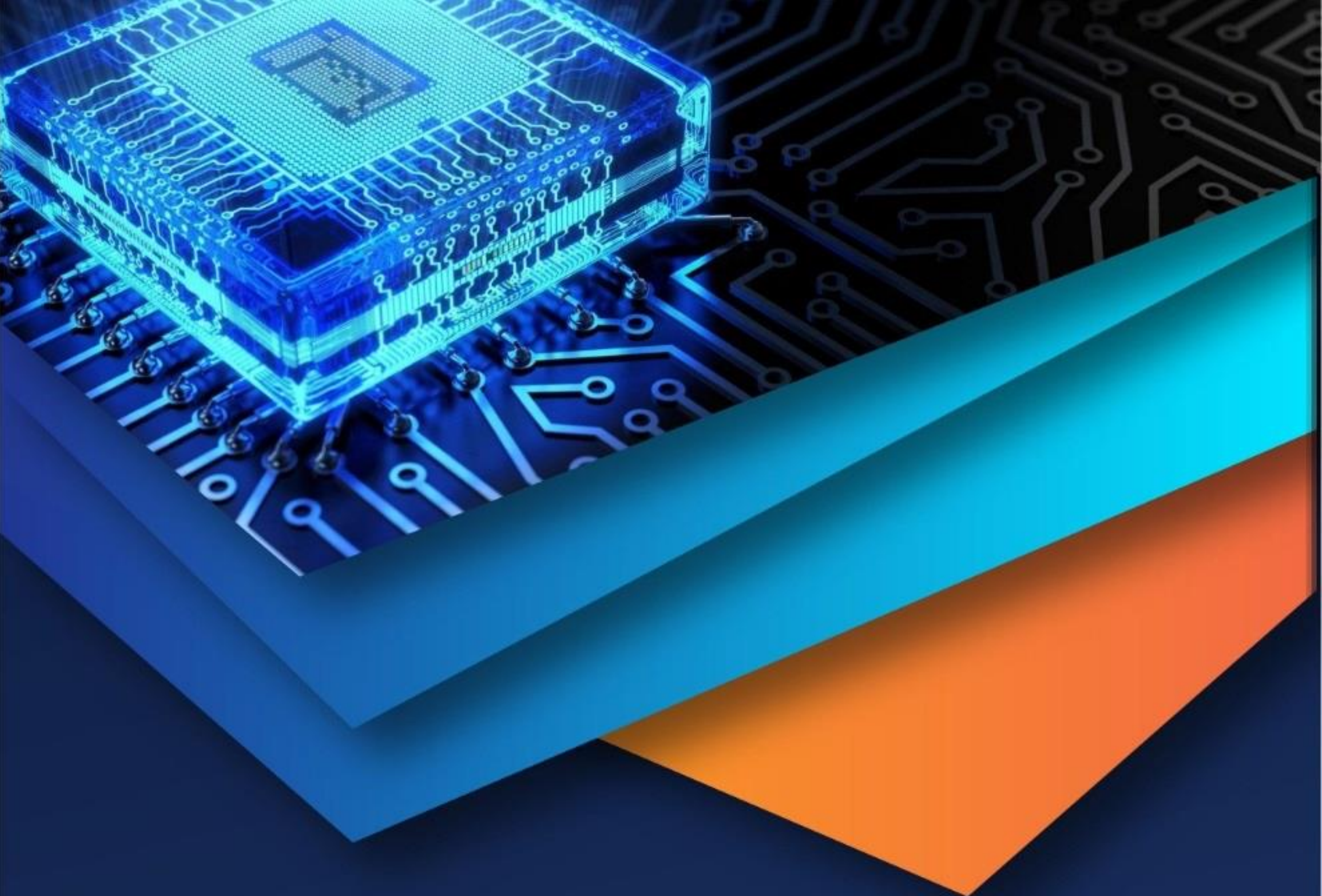
[10] H. R. Morano Okuno, G. Sandoval Benitez, V. V. Lopez, L. Villagomez Guerrero, E. G. Moran and J. de Jesus Solis Cordova, "Introducing Virtual Reality in an Automated Manufacturing Systems course - First approach," 2020 V International Conference on Information Technologies in Engineering Education (Inforino), 2020, pp. 1-5, doi: 10.1109/Inforino48376.2020.9111843.

[11] A. Candra, M. A. Budiman and K. Hartanto, "Dijkstra's and A-Star in Finding the Shortest Path: a Tutorial," 2020 International Conference on Data Science, Artificial Intelligence, and Business Analytics (DATABIA), 2020, pp. 28-32, doi: 10.1109/DATABIA50434.2020.9190342.

[12] C. Ju, Q. Luo and X. Yan, "Path Planning Using an Improved A-star Algorithm," 2020 11th International Conference on Prognostics and System Health Management (PHM-2020 Jinan), 2020, pp. 23-26, doi: 10.1109/PHM-Jinan48558.2020.00012

[13] J. Li, D. Wu, P. Jiang, Z. Li and S. Song, "Locally Aligned Image Stitching Based on MultiFeature and Super-Pixel Segmentation With Plane Protection," in IEEE Access, vol. 9, pp. 168315-168328, 2021, doi: 10.1109/ACCESS.2021.3134887.

[14] Shreyas Mistry, Prof. Arpita Patel Image Stitching using Harris Feature Detection, International Research Journal of Engineering and Technology (IRJET), https://www.irjet.net/archives/V3/i4/IRJET-V3I4439.



10.22214/IJRASET

INDEX COPERNICUS 45.98

IMPACT FACTOR: 7.129

TOGETHER WE REACH THE GOAL

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY