# Campus Virtual Tour

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*Abstract—The virtual tour is an integral part in digital travel revolution. The concept of the virtual tour comes under larger umbrella of virtual space and cyberspace. Like virtual reality and cyberspace, virtual tours have developed as the Internet has developed. They are way for people to experience and explore via Internet, a place which exists in reality as a physical space. For example, instead of physically going to Paris, user can stay at home and virtually explore it from their computer.*

*Not everyone can visit each and every college campus before making college decision - time, distance, working commitments or finances might get in the way. In recent years many universities and colleges have become adroit at offering virtual visits. In this paper we propose implementation and development of virtual tour of Vidyalankar Institute of Technology using photo-stitching technique. The significance of using this technique is to get the panoramic view of the campus area which will enhance the journey on the Internet. We also show the implementation of embedding pop-ups with prominent locations in virtual tour to make it more persuasive for new users.*

*The main aim of this research is to mimic real world by computer generated environment and engage all the senses of people using very powerful and compelling technology that is Virtual Reality. From this project we hope to enhance the popularity of our college infrastructure and facilities provided in our college. Professors evaluated the virtual tour for its accuracy, speed and quality. After evaluations of the prototype, the results showed that virtual tour is easy to use and navigate with smooth functioning and consistency in all devices. The completed prototype is proposed to be released on Vidyalankar Institute of Technology's website (www.vit.edu.in).*

*Keywords—Virtual Tour, Panoramic view, Photo-Stitching technique, Campus tour*

## I. INTRODUCTION

Virtual interactive tour is basically 360 view of college campus. A virtual tour is the simulation of an existing location with the help of sequential still images. They help in recreating a realistic representation of reality. Virtual tours help in presenting views to inaccessible areas and provide an interesting and excellent alternative to fieldwork when expenses, time or logistics are an issue for people[1].

Modules:

a) *View:* Entities comprise of navigation bar for guidance and to explore every view.

b) *Drop down box:* Directly navigate to the choice of entity instead of sequential, linear navigation.

c) *Media*: Videos and pictures are involved in respective places to give more information about campus.

d) *Event List*: Gives idea about all the future events those are going to take place in campus.

While academics is the most important aspect to choosing a college, campus life isn't too far behind. Students can explore and learn about the landmarks that set college campus apart from others. When they are in the final decision making process, it may just be the details that makes campus memorable enough to make the final cut. A virtual tour allows parents to see the laboratories their children will experiment in, the canteen their children will eat in, and the facilities they will learn in. A virtual tour helps freshman start to visualize themselves as a part of college campus.

The purpose of this project is a virtual tour makes user to view college campus from anywhere. Unfortunately, it isn't always possible or practical for parents or students to visit campus physically due to location, transportation, time and resource restrictions. The tour would be accessible from any appropriate device with proper internet connections. Using their devices students or users can navigate through different prominent entities of college to learn more about the campus environment. Visitors would have flexibility to roam virtually in campus and to go to any destination just by using directions for which no special skill set is required.

In this paper, we propose a virtual interactive tour of prominent, distinct areas of Vidyalankar Institute of Technology. There are several advantages of our virtual tour: 1) The entire process of accessing virtual tour, what all areas will be seen, how will be the overall experience of the viewer is explained by interactive animated instructor at the start of virtual tour. 2) Each and every distinct areas of campus is described by a small pop-up showing information about that area. 3) The viewer can view the virtual scene at all directions.

The rest of this paper is organized as follows: Section II discusses related work. Section III discusses actual implementation of virtual tour. Section IV includes results and discussions. Section V concludes the paper.

## II. RELATED WORK

For most business purposes, a virtual tour must be accessible from everywhere. The major solution is a web-based virtual tour. In addition, a rich and useful virtual tour is not just a series of panoramic pictures. A better experience can be obtained by viewing a variety of materials such as that obtained from videos, texts, and still pictures in an interactive web content. There are many ways to gather data in a mixed web content, such as using rich content builders (Java applet or Adobe Flash being two examples) or a Web content management system.

Most of the previous research on virtual tours has focused on adding more and more contents than focusing on quality and expressiveness of virtual tours. Very few institutes in India have actually implemented virtual tours. Flash player from Adobe has become the most popular way to view virtual tours. Because of good quality of panoramas playbacks and

almost unlimited capabilities, Flash developers quickly replaced their competitors in market. QuickTime, Deval VR, Java and other formats which had been popular earlier, became a history[2]. Amity University in India has implemented virtual tour which allows viewers to explore locations like libraries, classrooms, courtyards, labs, studios, sport complex and other facilities[3]. This Virtual tour is implemented using Flash. With the fast development in technology, Flash format have begun to lose its position, in favor of HTML5 format. Mobile devices as well as all modern browsers support HTML5 format now. However, Flash panoramas are not able to be quickly replaced in the market of virtual tours viewing formats. Not all browsers are able to display HTML5 panoramas correctly. So, the best way to reach out to maximum viewers is using both the formats simultaneously.

Using Apple VR software and Flash, Oxford University has developed their virtual tour. It contains hundreds of interactive panoramas of the campus and town[4]. Many virtual tours are implemented around the globe – Virtual tour of White House, Sydney Opera House, Pyramids, South Pole to name a few.

To study the development of virtual tours using image-stitching technique a research was conducted. Campus virtual tour of UiTM Perlis was developed to conduct this research. Adobe Photoshop CS3 was used for stitching images. Implementation of virtual tour was done using Tourweaver 4.00 professional edition.

Szeliski R. (2005), in his paper stated that the purpose of stitching multiple images together is to create beautiful high resolution panoramas. There are two methods that can be used to stitch multiple photos together: direct intensity-based and feature-based registration algorithms. Photo stitching is the process of combining multiple photographic images with overlapping fields of view to produce a segmented panorama or high-resolution image. This technique is commonly performed through the use of computer software; most approaches to image stitching require nearly exact overlaps between images and identical exposures to produce seamless results (Thomas, 2007)[5].

According to Wu, Wang & Wang (2004), in their project plan of Virtual Tour in Tsinghua University, they used stitching photographs to form the virtual environment. The campus virtual environment is composed by regions of static sceneries. The observer at the center can view the virtual scene at all directions. Each region can be constructed by a photo with Inverse Projection process. After synthesizing all the regions by the Image Matching-Stitching, they obtain 360° cylindrical panoramic image.

*A) Challenges in current Systems:*

Virtual tours have been around for years, but they still pose a lot of pitfalls for both web designers and users.

Nowadays, a tour delivered online is becoming the expected standard. People of course still travel with a real live tour guide in a tour group, but that is becoming rare. Visitors are more likely now to use a mobile device on site to guide their tour – be it in a museum or on a walking tour. And, people like the convenience of self-guided touring.

*a) Flash Plugin Required*

Flash technology's days are probably numbered, and they have been for a while. Virtual tours that rely on the user having a Flash plugin are problematic largely because you avoid the segment of users that for one reason or another don't have the plugin. Estimates of those numbers are all over the map. Security issues with Flash further complicate plugin use and adoption. And, the question that has been around since the beginning of Flash applies – what content do you do for those that don't have the plugin!

*b) Not Enough Useful Detail*

Many virtual tours are glorified slideshows. There isn't anything wrong with slideshows – they serve a purpose. But, as technology has evolved, the expectation of a tour is that it will provide richer content and detail about the subject matter. And, that's different than a slideshow.

*c) User Expectations*

360 panoramas can cause big problems for users on mobile devices – processing, bandwidth, and delay. On large monitors, they can arguably cause dizziness. The question to ask is what does user really expect from Virtual Tour?

*d) Mobile Device Compatibility*

The importance of compatibility with mobile devices cannot be overstated. In many countries, mobile devices are replacing the PCs. Marketers, business owners, and museums that focus purely on desktop-based virtual tours are potentially making a huge mistake. It would likely be better for most to sacrifice some bells and whistles in virtual tours to maximize compatibility across mobile and desktop.

*e) Cost*

Even though free tools for different approaches to virtual tours exist, there is a cost involved in hiring professional photographers. Keeping tour up-to-date with fresh content is the only necessity.

III. IMPLEMENTATION

This section focuses on the resources and tasks necessary to implement the system and its entire functionality.

*A) Workflow:*
*a) Clicking pictures of college campus:*

All important areas like Library, Classroom, Lab, Canteen, Gymkhana, and Auditorium are covered in the virtual tour. Total 24 entities of college campus are included in the tour and for every entity around 90 pictures are clicked to get 360 degree view of that entity.

*b) Image-stitching technique to create panoramas:*

The word "Panorama" suggests a view that is unbroken, since a panorama can be series of images or panning video footage.

Image stitching or photo stitching is the process of combining multiple photographic images with overlapping fields of view to produce a segmented panorama or high-resolution image. Commonly performed through the use of computer software, most approaches to image stitching require nearly exact overlaps between images and identical exposures to produce seamless results.

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The software that was used for stitching Images is Kolor Autopano Giga[6].

Multi-resolution full spherical Panorama of VIT Auditorium created using Image-stitching technique:



*Figure 1: VIT Auditorium Panorama*

### c) Enhancing Panoramas:

The aim of Image Enhancement is to improve the visual appearance of an image. One of the most important stages in Image analysis is Image Enhancement techniques which improves the quality of images for human viewing, removing blurring and noise, increasing contrast and revealing details are examples of Image Enhancement operations. The software that we used for Enhancement is Adobe Photoshop Lightroom.

### d) Creation of Virtual Tour:

After getting panoramas of 24 entities of college campus, import those panoramas into a software - Kolor Panotour Pro. This software allows you to link panoramas with each other, to create hotspots which allows you to move from one area to another in virtual tour. Tour also involves on click sound feature which dictates information of the area where you are entering.

### e) Events Calendar:

Creating Events Calendar of VIT using HTML, CSS, and JavaScript and linking it with created virtual tour.

### B) Steps to be followed while stitching images to create Panorama:

Making beautiful 360-degree aerial panoramic images is often very difficult. The main problem lies in the fact that the point of view is constantly moving.

For panoramic stitching the ideal set of images will have a reasonable amount of overlap (at least 15 – 30%) to overcome lens distortion and have enough detectable features. The set of images will have consistent exposure between frames to minimize the probability of seams occurring[7].

Also the ratio of width to height of panorama image needs to be taken into account to create a visually pleasing composite.

### a) Control points matching:

Control points are used to indicate which points in the source images coincide, and therefore should overlap in the panorama.

The control points editing area is divided into 2 windows where 2 images selected from the list can be viewed and the different tools could be used to edit the control points.

The selection list is divided into 4 closely related parts (Current link, images list, links list and control points list):

- Any image selected in the image list will display the current link which it belongs, its list of links or control points in common with other images (according to the selected tab).
- The links tab displays the list of common links when you select one or more images.
- The Ctrl Point tab displays the list of common control points when you select one or more images.

### b) Blending of all Images:

The role of the blending is to define how the pixels of each image will be merged. Multiband blending allows blending the overall color of the images and mitigate the differences in the scale and/or the exposure existing between the juxtaposed images to remove sharp differences in the exposure between pictures and get a panorama as homogeneous as possible.

### c) Selection of Anti-ghost:

Anti-Ghost is the smart image-cutting algorithm (first appeared in Autopano 2.5).

During the blend of stitched images, the layered pixels are not necessarily identical. This can be caused by stitching problems (when nodal point is not respected, when lens distortion is hard to correct...) and/or from objects in the picture moving between shots. The Anti-Ghost is designed to find a cutting path between images in order to avoid blending pixels that don't match. The "smart" part is choosing a cut that preserves the integrity of the photographed subjects as much as possible.

## IV. RESULTS AND DISCUSSIONS
### A) Test Cases

| Sr. No. | Test Case Parameter | Method Used | Test Results |
|---|---|---|---|
| 1 | Application Design | Usability Expert was consulted. Students & Teachers tried out the system. | Attractive Layout & Design Scheme |
| 2 | Usability | Usability Expert was consulted. Students & Teachers tried out the system. | Easy Use & Navigation |
| 3 | Accuracy | All Entities are compared with the actual campus. | Complete model & its working is accurate |
| 4 | Response Time & Speed on various platforms | Tested the application on Desktop/Laptops and Android Devices. | Smooth Functioning & Consistency in all devices |

*Table 1: Test Cases*

### B) Graphical User Interface

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*Figure 2: Homepage*

This is the first screen which appears when you visit the virtual tour section on the website. It includes the "Welcome to Virtual Tour of Vidyalankar" button which directs you to the main gate of college campus as shown in figure2:



*Figure 3: First Screen after Homepage*

The screen includes navigation buttons at bottom right side. These buttons include previous panorama, next panorama, zoom in, zoom out, move up, down, right and left, home, hide hotspots, etc. The Virtual Tour also provides drop down list which includes areas of VIT campus that can be explored virtually.

## V.   CONCLUSION AND FUTURE WORK

The significance of developing virtual tour of Vidyalankar Institute of Technology using photo-stitching technique is to get the panoramic view of the VIT campus area which will enable viewers to experience prominent entities of VIT campus on the Internet as if they were really there. This system also has interactive voice instructor to guide and advice user in online virtual environment. The interactive instructor attempts to provide adaptive guidance, to perform engaging storytelling & to promote user's participation through virtual tour. The completed prototype is proposed to be released on VIT's website.

These recommendations below could be considered to improve the quality and features of the virtual tour:

1. Show the real activity that can be done at each hotspot. The virtual tour application can be improved by showing the real activity that can be done at the selected place such as at the sports area where the activity like a tournament could be done and academic blocks for lecture purposes or seminars.

2. Virtual tour guide can be developed to instruct, guide, and advise and to perform tasks on user's behalf. These characters are based on a computer keyword spot program with a natural language processing system that delivers pre-scripted statements from a knowledge-content database and an MS- agent character that performs such statements as gesture-choreographed dialogue pieces.

## REFERENCES

[1] https://www.techopedia.com/definition/4920/virtual-tour, [Online]

[2] http://spherical.photography/3d-panorama-players.html

[3] "Amity University - 360 degree campus tour," http://www.amity.edu/admission/amity_360.asp, [Online].

[4] "Virtual Tour of Oxford," http://www.chem.ox.ac.uk/oxfordtour/, [Online].

[5] Norfiza Ibrahim, Nadia Abdul Wahab, "Developing and Evaluating a Virtual tour Prototype Using Photo-stitching Technique" in *proceedings of the Second International Conference on Computer Engineering and Applications*, pp. 390-392,2010

[6] http://www.kolor.com/wiki-en/action/view/Documentation, [Online]

[7] https://en.wikipedia.org/wiki/Image_stitching, [Online].

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