Adapting Autodidacticism by incorporating project in image processing course

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Abstract*—Continuous Process of self-learning is an effective tool to enhance creative skills and do innovative things. Though the tools have changed over years, the self-learning has indeed prevailed. This individualized method of learning has reduced face to face teaching and has enhanced the liberty of what to learn; how to learn; where to learn. This flexibility is a vital parameter in open ended learning process. This paper discusses the method of incorporating self-learning approach in digital image processing course through project. The paper highlights computer assisted experimental results used for auto didacticism. Autodidacts seek instructions and guidance from experts, friends, teachers, parents, siblings and community.

***Keywords*—Autodidacticism, Self-learning, Image processing experiments, project based learning**

I. INTRODUCTION

Didacticism implies an artistic philosophy of education[1]. For an efficient digital image processing course, a special focus needs be set on student's experimental projects emphasizing on improving the practical ability. Learner's self-esteem will enhance and it is this hand-on experience that can significantly facilitate the learning of the image processing concepts.

Project-Based Learning (PJBL) courses affect the self-learning capabilities of the undergraduate engineering students of Electronics and communication engineering curriculum [2]. In auto didacticism there is great diversity in the practical application. For these reasons, an attempt in self-learning reforms and innovations for this course are described in this paper.

II. CONVENTIONAL METHODS OF EXPERIENTIAL LEARNING

Conventional Experiential learning strategies emphasize the role of lab sessions, demonstrations, assignments, tutorials, workshops or online courses. The major drawbacks includes fixed set of prescribed experiments as per curriculum , limited hours per week, fixed batches, less independence for carrying out innovative ideas. Demonstrations are less effective for critical learning [3]. Assignment if repeated may have similar solutions wherein participation of students might be less significant. Tutorials are much theoretical having classroom approach giving less time to hands-on [4][5]. Though individual can gain knowledge from Workshops, they are normally specific to certain areas only and not result oriented. Online experimental courses though flexible with timings, have less team effort.

Conventional image processing course has no experiential approach like design conduct evaluation and feedback. Also the students will be following limited study materials as prescribed by the syllabus. The programs and algorithms are pre-defined with expected results and outputs.

III. MOTIVATION FOR ADAPTING PROJECT BASED LEARNING IN IMAGE PROCESSING COURSE

One image is worth thousand words. The information conveyed is subjected for tactical analysis. Even though there is mathematical background at the back end the result is much graphical visualization in the front end. Students are much more interested in applying their concepts and analyze the effects. The project based learning therefore has more self-learning component. The approach of students might be;

1. Students start with a basic question, such as "What's in our project?"
2. They explore the basic question by engaging in inquiry. For example, they may analyze changes in image quality.
3. Students work collaboratively to address the project. Lower achieving students might benefit from team effort.
4. Institutions allow them to participate in authentic activities that might otherwise be beyond their reach.

Students who will not pursue a career in image processing such a back-ground will prove helpful in other areas such as pattern recognition, graphics, robotics, multimedia, virtual reality, computer vision and medical imaging.

IV. INCORPORATING PROJECT BASED LEARNING IN IMAGE PROCESSING COURSE.

Emphasis should be on Integration of Real-World Problems to an Image Processing Curriculum. Several educational projects using image processing have been explored. Results from the demonstrated project show the effectiveness of image processing[6][7][9]. The goal for students is to experience the active processing and manipulation of image data.

In a fast developing field such as image processing, self learning is the key to update student's knowledge through any of his comfortable methods. Project-based approach, on the other hand, emphasizes analysis and implementation using group work[10].

The undergraduate image processing course at BMS College of Engineering at Bangalore follows a problem-based approach integrated with experimental-based learning experiences. Autodidacticism the art of self learning will be an effective way to teach image processing course as follows[8]

1. Self learning from team to select a topic. Students shall select any topic of their interests in an image processing field and submit an abstract of their idea within deadline.
2. Facilitators will not interfere in the topic, provided topics are not repeated.
3. Students are free to use resources and open discussions to implement their ideas. Also students are motivated to use open source tool.
4. The assessment is done through oral as well as written presentation and implementation of the projects.

Table 1: Topics of projects

Sl.	Projects
1	Deblurring Images using Blind Deconvolution Algorithm
2	Image Blending using MatLab
3	Image Sharpening using Laplacian Operator
4	Photoshop effects on Image
5	Face detection using viola jones Algorithm
6	Optical code recognition
7	Image enhancement using weinerfilter and Laplace Transform
8	Face and face feature recognition
9	Color Filtering from an Image
10	Edge detection in an Image
11	Panoramic Image Stitching
12	Finger print matching using edge detection
13	Image Compression using DWT
14	Morphological Cancer cells detection
15	Texture Segmentation using Texture filters
16	Discrete Cosine Transformation Inverse Cosine Transformation on Images
17	Color based Segmentation using Color Space
18	Maze solving using image Processing
19	Blob detection in Images
20	Encryption and Decryption of Binary Images
21	Image Segmentation using Robust Fuzzy C-Means Logic
22	Measurement of heart rate using a smart phone Camera
23	Image resize using Simple tool

V. AUTODIDACTICISM IN IMAGE PROCESSING PROJECT

Of the entire project done, one sample project "panoramic image stitching" is discussed as a case study. This project Implementation of image processing course by a team of students is presented as case study. The students were given 3 weeks for submission of the project since only software simulation tool is used. The typical flow of implementing their idea through Autodidacticism can be visualized. Evaluation need not be on the result but the approach of students and flow towards the project.
The figure 1 to 5 shows the approach of students towards implementing the project along with its limitations.

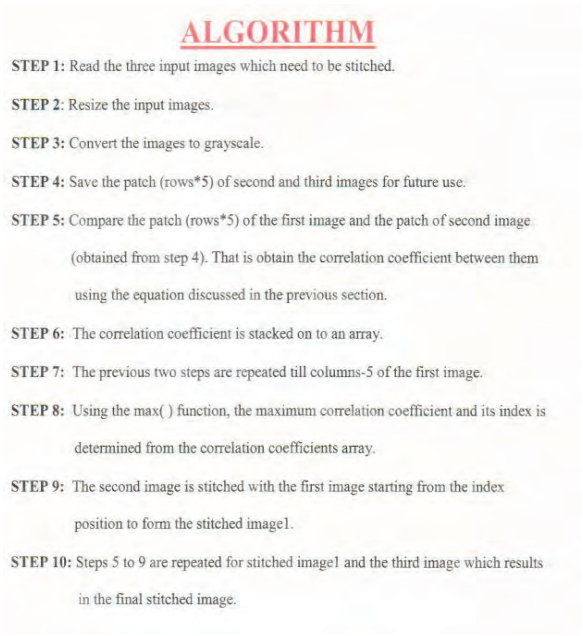
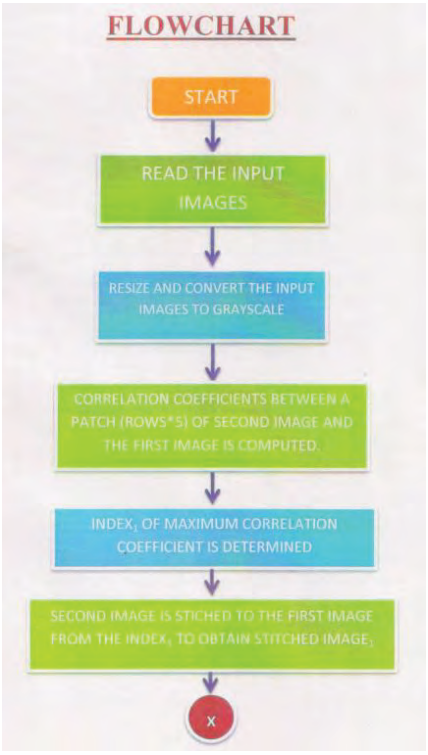


Fig 1: Algorithm flow of project



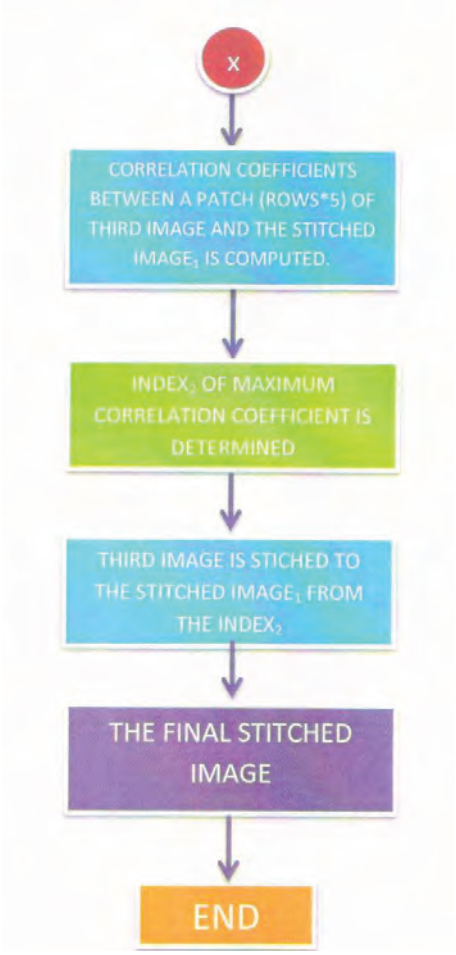


Fig 2: Flow chart of project

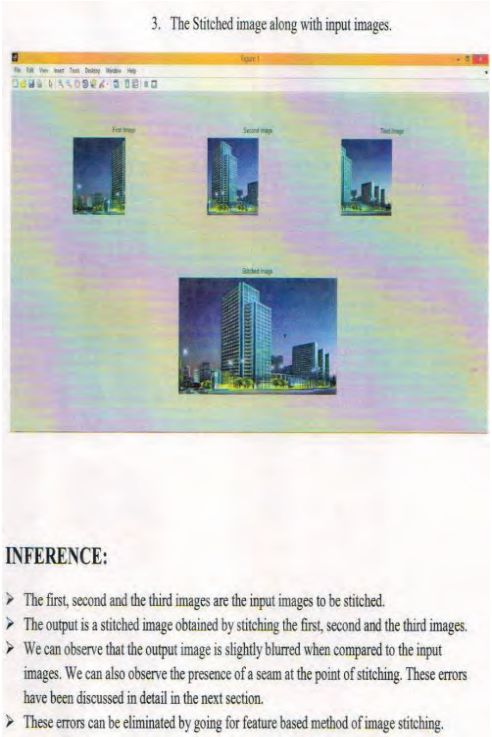


Fig 3: Result of the project

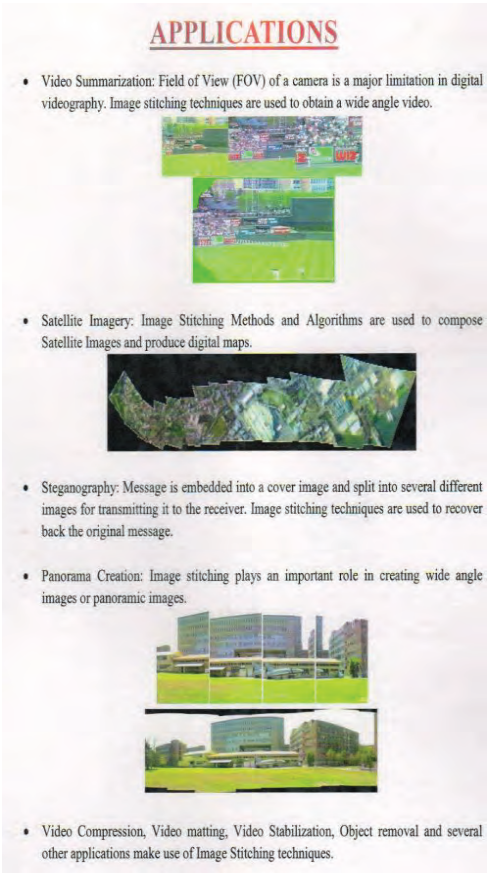


Fig 4: Application of the project

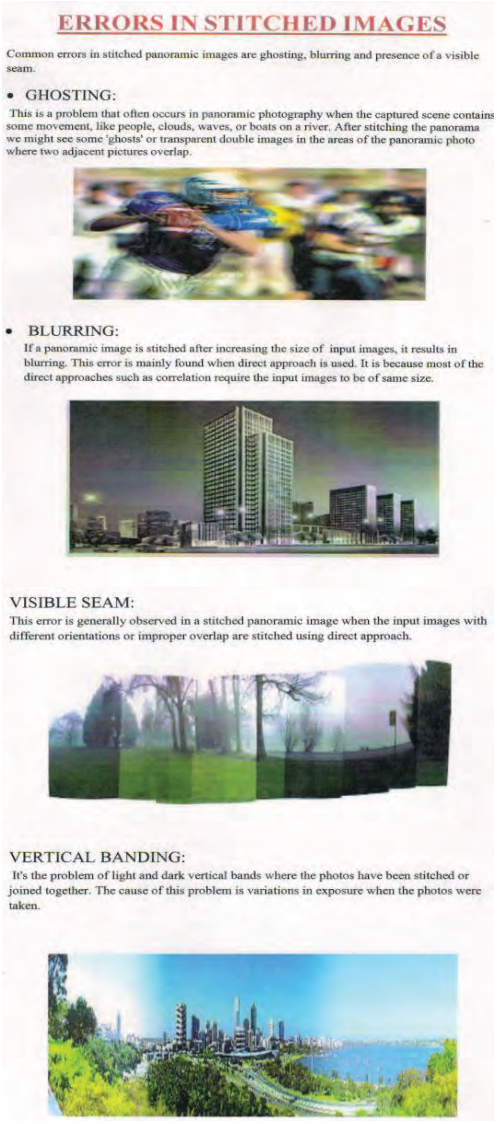


Fig 5: Errors in project

VI. CONCLUSION

In the dynamically varying scenario of Global industry, Engineering graduates and facilitators are expected to be competent in technical skills, as well as in personal skills, in order to face the challenges in the real world environment. Similarly, the growing innovation of pedagogical method, especially in technical engineering has come to narrow the gaps between the real-world and technical education. Teaching-Learning methods such as autodidactism, PBL has a great potential in producing such desired graduates, and the presented case study indicates the flow from selecting a project to implementing a project with limitations. This shows adapting autodidacticism by incorporating project in image processing course has a good impact on academics and curriculum development. It is believed that such exemplary practices can specifically expedite the pace to achieve the intended learning outcome and thus it is suitable to be accepted as a tool for Outcome Based Education.

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