IoT Based Automation in Enhanced Learning Scheme

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***Abstract*— nowadays learners of technical streams are facing tremendous problems while grasping the knowledge of different subjects, henceforth the level including the status of education is steadily diminishing. Out of most of the causes of this decaying state of education is learners are struggling to grasp and comprehend the topics. A resolution to this problem is introduced in this paper. It is based on the VAK approach that is most preferred three learning methods namely visual, auditory and kinesthetic. It is necessary to organize the learners based on their learning styles and assigning them assignments as per their preferential learning styles consequently. This kind of projected system puts forwards an IOT based system that will automatically classify learners, keep the record of their submission history, assignment, performance, etc. This will assist in reducing the efforts of faculty members and magnify the performance of learners from 5 to 42% by customized creating activities as per the hereditary learning style.**

***Index Terms*— IoT, learning style, VAK approach**

I. INTRODUCTION

Learning styles play an important role in grasping and understanding the power of a student. If the activities, assignments, tutorials, etc. are designed as per the preferential learning styles of the student it can result in significant improvement in grasping and understanding the subject by the student. Fingerprints are manifested in the womb of the mother and they can be employed to recognize the learning style of the student. There are four general patterns of fingerprint i.e. whorl, loop, arch, and accidental as shown in Figure

Ridges on the skin of the palm and toes begin to form after the 13th-week embryo grows in the maternal body. The formation of these patterns i.e. dermal lines will complete during the 24th week. Once fully developed the dermal patterns remain unchanged for the whole life. The formation and interpretation of these patterns are associated with the evolution of the brain and the learning tendency of the self.

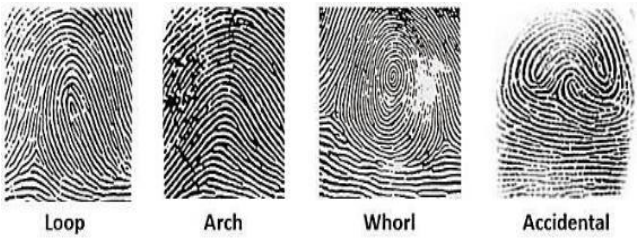

Figure 1: Common samples about fingerprints

Figure 2 exhibits the characteristic aspects of the fingerprint.

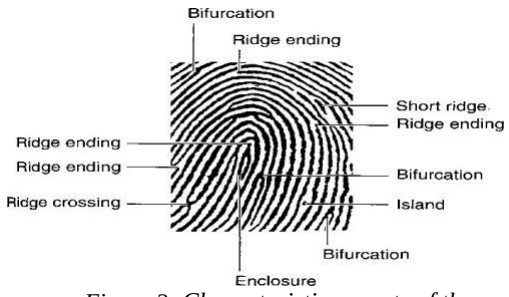

Figure 2: Characteristic aspects of the fingerprint.

A. Learning Styles: VAK approach

Most people have a certain technique or approach which is better than other approaches to interacting with and processing information. The three main learning styles are [1]

(i) Visual
(ii) Auditory
(iii) Kinesthetic

While composing the assignments an educator has to keep in mind the preferential learning method of that crowd of learners and customize the homework. For example, for the auditory group, the assignment may ask them to summarize their responses to lectures they have heard or they may be asked to listen to audio lectures and give oral tests. Whereas for a visual group their assignments may involve explanation with illustrations, diagramming, reading maps, drawing, sketches, preparing notes, etc.

In the same line group with kinesthetic as preferred learning method should be provided assignments including physical activities, practical exam rather than written, use role-plays, flashcards and related activities.

The rest of the paper is divided into different sections for ease of understanding Section II directs on the associated work done in this domain. Segment III describes the proposed design and segment IV presents the results and discussion. In the end, the conclusion of the literature has been given along with the expected scope in section VI.

II. RELATED WORK

M. D. Roca et. al. [2] in their article titled "Preferential complementary learning style-type indicator" described an automated method which employed a web application based Indicator Test of recognizing preferential learning style of the learners however their work was solely directed

upon preferred forms of learning, but they did not address Literature review of enhances learning method and preferential learning style incorporating VAK approach. They also analyzed that the learning manner of a student appeared in time-saving during the assessment of the student rather than utilizing conventional techniques such as a questionnaire. Their model continued recognized as Preferential Complementary Learning PCL. PCL concentrated on one's personality and learning expertise, recognizing somebody as a whole.

P. Gounon and X. Dubourg [3] in their work described a pattern to prepare training activity for learning contexts. They begin by means a tutoring activity, then they conferred design structured in 3 parts: the tutor, the taught person, including the tutoring designs

D. Whittington and T. Dewarin [4] their work titled "A strategy for studying learners using advanced learning technologies," proposed a technique to study the performance of learners using forward learning. They explained that the Myer Brigg technique for recognizing the personality of the learner is useful when investigating learner behaviors in an online learning scenario.

Later in 2016 J. J. Maldonado, et. al. [5] in their work proposed a technique especially in the current scenario where Massive Open and Online Courses (MOOCs) are gaining rapid popularity and transferring knowledge is a challenge, as the student/learner has to understand the topic without the support of a teacher. They further suggested that each student has his learning style and designing MOOCS in accordance to the learning style of a participant may help him better grasp the subject.

From the above literature survey, it can be inferred that each individual has their preferred learning style, including based on this a novel design is proposed in section 3.

III. PROPOSED MODEL

The proposed model requires that the data of the total number of learners are enrolled in the database. The faculty member has to design assignments and prepare them as per the three sections of learning style that are visual, auditory, and kinesthetic (read/write).

[6, 7, and 8]. The proposed system will check the fingerprints of each learner and analyze its learning style. Each learner will be categorized into one of the three learning styles and settled into 3 groups. Lastly, a database of all the learners will be prepared according to their learning style and learners will be classified into 3 groups. Whenever an assignment is due the learner has to put his finger on a fingerprint scanner and IoT based system will automatically recognize the learner, check his submission history, and automatically assign the assignment as per the pre-stored group in the database. The proposed system will not only improve productivity by conserving a lot of time for faculty members which is otherwise wasted in maintaining records, submission details, assignment history of the student, marks, etc. But will also enhance the overall learning experience of the student by modifying the assignments as for the learning strength and interest [9, 10, and 11].

A. Automated assignment allocation and validation method

In the proposed system all the learner's database will be prepared according to their learning styles and club accordingly. The proposed system will not only distribute/ assign the tutorials to the learners but will also keep a record of the progress, marks scored, assignment submission history, etc. Based on the record of two back-to-back semesters an analysis of the improvement in grasping the subject can also be done. The summary and validation process of the recommended system is shown in Figure 3.

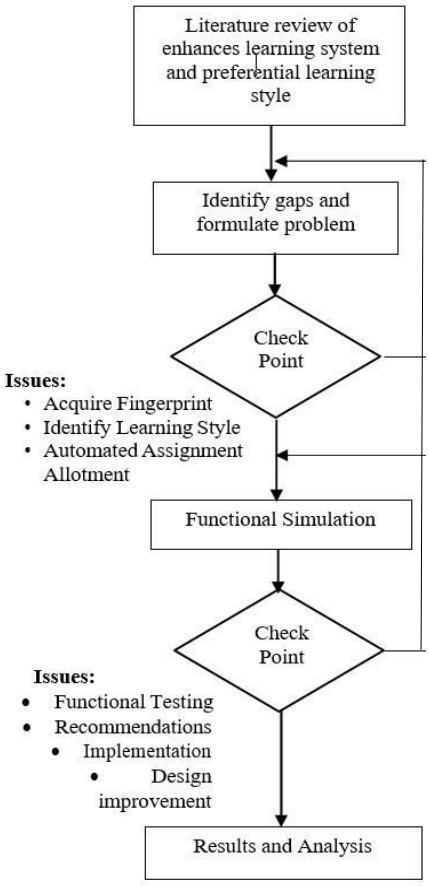

Figure 3: Analysis and validation process flow of the recommended design of automated enhanced learning system.

B. Experimental setup

The proposed system can be implemented using the Arduino Uno interfaced with the IoT module. Figure 4 shows the fingerprint sensor (FPM10A fingerprint module) and Figure 5 and 6 shows Arduino board with necessary pin descriptions and 16x2 LCD module to showcase results on it respectively [13].

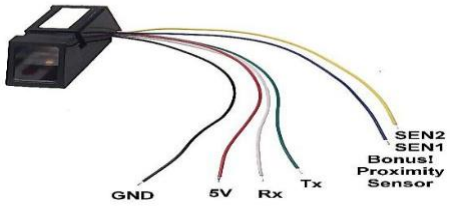

Figure 4: Fingerprint module with pin specifications

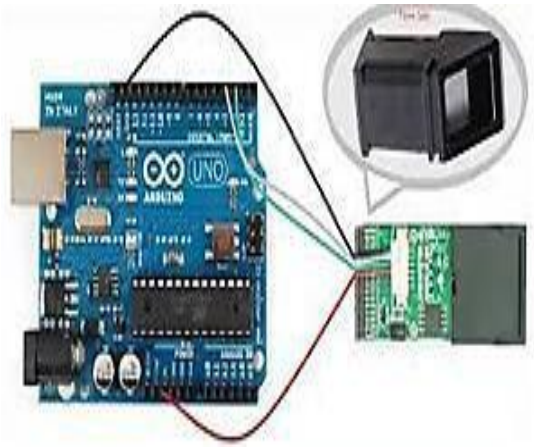

Figure 5: Experimental setup of the proposed model

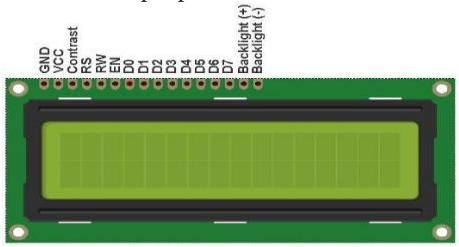

Figure 6: 16x2 LCD module

IV. EXPECTED OUTCOME

A list of desirable engineering students can be prepared and the setup can be used to acquire their fingerprints and classify them according to their learning abilities.

Table 1: Sample fingerprint of students and fingerprint type (Tentative study)

Sr. No.	Name	Fingerprint	Type
01	Aalekh		Loop
02	Akshat		Loop
03	Aryan		Loop
04	Ashutosh		Whorl
05	Avichal		Loop
06	Dipali		Whorl
07	Ishan		Whorl
08	Kartikay		Arch
09	Kirti		Whorl
10	Kushagra		Loop
11	Monika		Loop
12	Muskan		Loop
13	Nihit		Whorl
14	Praneel		Loop
15	Rajan		Loop
16	Ritvik		Loop
17	Samarth		Whorl
18	Samriddhi		Loop
19	Sudhakar		Loop
20	Vanaya		Whorl

Students can be categorized as per the learning styles into 3 groups as given in Table 2.

Table 2: Learning styles strengths (Tentative values)

S.No	Name	Visual	Auditory	Kinesthetic
1.	Aalekh	33.14	27.43	39.43
2.	Akshat	29.35	37.88	32.76
3.	Aryan	28.66	36.66	34.68
4.	Ashutosh	30.94	40.75	28.30
5.	Avichal	25.97	42.86	31.17
6.	Dipali	43.60	30.40	26.00
7.	Ishan	32.84	36.94	30.22
8.	Kartikay	42.33	39.68	17.99
9.	Kirti	26.97	40.45	32.58
10.	Kushagra	42.33	39.68	17.99
11.	Monika	30.94	28.30	40.75
12.	Muskan	32.26	34.84	32.90
13.	Nihit	35.71	32.14	32.14
14.	Praneel	29.35	38.53	32.12
15.	Rajan	33.14	27.43	39.43
16.	Ritvik	34.05	23.50	42.45
17.	Samarth	34.84	32.91	32.25
18.	Samriddhi	30.65	40.54	28.81
19.	Sudhakar	30.58	40.93	28.49
20.	Vanaya	19.40	60.45	20.15

Based on values from Table 2, the groups as per learning styles are made and can be interpreted as shown in Figure 6.

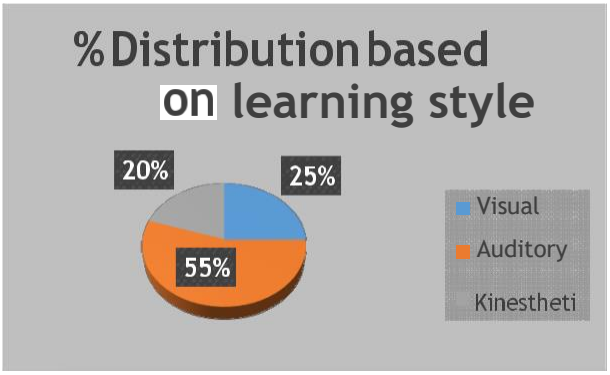

Figure 7: Percentage distribution of students into groups (VAK) based on their learning style

With the help of the proposed system depicted in Figure 5, the data acquired from the fingerprint scanner (Table 1) can be analyzed and the students can be divided into three groups as per their preferential learning style.

Figure 6 gives the percentage distribution of students as per their preferential learning style. After analysis expected percentage improvement in the performance of students is can be made and which is shown in Figure 7. It can be observed that there is a 5 to 42% increase in the performance of the students.

From interpretation drawn in Figure 6, the preferential learning style of a sample of 20 students can be analyzed and it is evident that the majority of the students are of auditory type whereas the rest of the students are almost equally divided into the kinesthetic and visual type of preferential learning style

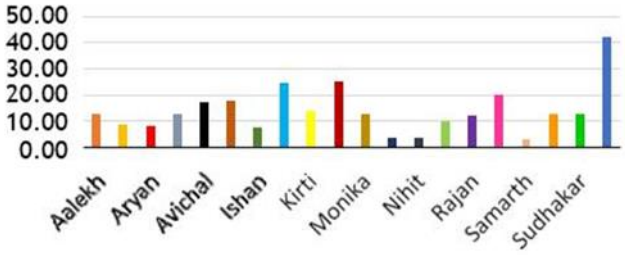

Figure 7: Percentage improvement expected in Performance of students.

V. CONCLUSION

IoT-based DMIT for assignment allotment system based on learning capabilities of an engineering learner is very helpful for assigning learner subject assessments. This will improve the learning experience of the learners. Learners will be able to learn, understand and associate subjects in a more reliable way. The proposed method will improve the quality and level of technical education heading to the better contribution of technical graduates to society. By the proposed approach the faculty member can easily assign the tutorials/ home assignments to the learners depending upon their innate learning fashion. The proposed system can be further enhanced by training the software and implementing the feedback of learning from the learners.

VI. FUTURE SCOPE

As the focus of universities and higher governing bodies are shifting towards promoting massive online open courses (MOOCs), online tutorials, video lectures, and other online e-learning alternatives.

The proposed method of enhancing the learning experience of individuals on basis of preferential learning style can become an important factor. This will help them in understanding, grasping, and building a knowledge base of the subject without the help of an educator. The recommended practice if adopted will become a new way of learning.

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