

Landmark Recognition Using Image Processing With MQTT Protocol

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ABSTRACT: The most important necessity for any user visiting an unknown or known establishment is true information. Even using Google and other searches wastes a lot of time. Asking around to people often confuses and misleads visitors. Hence, to bridge this user – information gap, a system providing complete true information to any naïve user needs to be formed. Our system takes an image as input from user and provides detailed real-time information. The image from the user will be processed and compared with the images in the database using Homograph. If match found, the information related to that image will be fetched and transferred using MQTT protocol. A client side will also be provided for small entrepreneurs to update information independently. There are various reasons why MQTT can be preferred over HTTP. MQTT is much faster and more flexible. Also, it works on various levels to provide security depending on user preferences. The image can be tested against various conditions according to camera quality and environmental conditions. Further, we will be explaining the system in detail along with its future scope in the world of computer vision.

KEYWORDS: MQTT protocol, SIFT algorithm, SQLite, Template matching, Java.

I. INTRODUCTION

The concept of Image recognition has been used frequently in various applications. Till date, various attempts are made to improve the functionalities of typical image based recognition techniques. Available researches show that with the help of machine learning, these techniques can improve the knowledge bases remarkably. Any typical recognition system uses a single image data for processing purpose which provides a moderate probability of content matching which in turn reduces the overall efficiency of the system. On the other hand, if pictorial data of any angle for specific landmarks is collected, the probability of perfect matches increases outstandingly. The threshold value decreases drastically as the dataset used will contain large metadata. This ultimately decreases user efforts and error generations. Deep learning plays a very vital role for real-time applications. The efficiency of any deep learning algorithm depends on its training data. The more useable data available more is the output availability. Also, compatibility for various devices is an important factor. When matching algorithms are used, main point to be considered is the processing time and space consumed for it. If pixel matching is discussed, it goes through the entire image and creates a sized histogram of pixel data. On the other hand, Content matching also creates a sized metadata set but it effectively reduces the processing time as it categorizes the image objects and uses these objects for comparison. Since the era of internet, HTTP protocol has been the backbone for networking client-server models. This protocol was mandatory for and communication purposes. In later years, other protocols were developed to overcome the inefficiency of HTTP to transfer over wireless networks. Foreexample, TCP/IP which controls the entire wireless data transmission. One of such is the MQTT (Message Queue Telemetry Transport) protocol. HTTP has a fixed packet size and transfers at a very slow rate in traffic. The ports that work for it are also standardized so any client will access only specific port number for transmission. Hence in overload cases, websites crash or transmit at minimum available rate. So MQTT was

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

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Vol. 7, Issue 5, May 2018

developed to try overcoming these issues. MQTT was developed by IBM developers. It provides high speed transmission for large scale data and is highly preferred for real-time transmission. Also, wide range of ports is available for connections so any specific port can be set. To summarize, all above concepts explained i.e. image processing, content matching, MQTT etc. play a vital role in Deep learning and data transfer to output remarkable efficiency. The references mentioned here will give a quick overview of some of these concepts and a basic idea of how exactly things are expected to work. The concept of Image Recognition has been around for decades and technologies have improved alongside with its help. It acts as the core for graphic and motion related applications mainly due to its performance boosting tools. It basically deals with graphical data and complex processing algorithms. Extracting useful data from images gained popularity in early 90s and invented concepts like face detection and biometric scans.

An important factor supporting this process is Storage technologies. Databases are being trained and developed to store and manage large data chunks. SQL, Mongo, oracle etc. are some to mention. Images consume a lot of data space and hence it becomes necessary to dedicate resources to support database management. Various image processing techniques require swift data interaction and faster processing algorithms which can be achieved by sophisticated database monitoring resources. Internet Protocols, which are the backbone of data transmission over the network also help in increasing overall efficiency. Traditional HTTP has now been substituted with different protocols which are more favourable. TCP/IP was created with the advancement of internet. One such protocol is MQTT (Message Queue telemetry transfer) protocol. Developed by IBM, it is much faster and flexible

II. LITERATURE SURVEY

This paper of [1] Content and Context information Fusion (2011), Author[1]: Tao Chen, illustrates the use of mobile application for recognizing different landmarks using SVM algorithm. It recognizes the picture using content matching. Information is extracted from the picture using Bow (bag of words) this content is matched with the image and GPS location and a result is generated. According to the survey made SIFT (scale invariant feature transform) is the most promising content analysis approach. However the large patches of SIFT in a single image makes computational cost of the image very high. To reduce this computational cost Bow has been used. However Bow has two major disadvantages (i) it ignores the spatial layout information of the landmark image (ii) It does not discriminate the different foreground in the image. In order to eliminate the first problem a spatial pyramid matching scheme is used. It partitions the images into fine cells and then calculates the histogram inside cell of the image. However this pyramid does not discriminate between different foreground. First the spatial pyramid decomposition is adopted to partition the image into a set of multi-resolution pyramid cells. The histogram of each cell is calculated using previously constructed codebook.

Finally, SVM issued to train these descriptors into a classifier This paper of [2] Survey on Mobile Landmark Recognition for Information Retrieval, Author[1]: Tao Chen, shows the use of mobile application for recognizing different landmark and to retrieve information from the picture. For classification purpose the is classified into different feature having global classification, local classification. The commonly used feature in mobile landmark recognition is global feature. Global feature differentiate picture according to its colour and texture. It uses multi-dimensional statistical responses of specific image filter to represent high dimensionality composed histogram feature. It also uses SIFT for retrieving information from the picture. This feature is used in almost all the landmark recognition app Augmented technology is also used to display information from the picture. SIFT improves the accuracy and improves the computational time. Colour-edge histogram patch (CEHP) are used to select an optimal number of candidates in the first stage.

Probabilistic model-based feature uses probabilistic model to extract region information from the landmark. the commonly used generated models include evidence-based, latent dirichlet allocation, theme model based and entropy based. Probabilistic descriptor mainly focuses on the probability distribution of salient region in the images. Patches-based feature has been used to achieve good performance. SVM is used under discriminative based classification. An SVM classifier is trained for each category of landmarks using one-vs-all strategy. In this paper, [3] Landmark

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Recognition Using Machine Learning, Author[1]: Andrew Crudge, input data of 193 images are given from google database. this data act as a training data set for the SVM. The training data set given to the SVM must contain vector that contain all the information of the images. To make each example the same feature dimension, the image must be cropped to an aspect of 5:2 ratio. To extract the feature from the image a HOG descriptor is used. HOG analyses the gradient orientation of the image. The images is divided into small cells. HOGdescriptor also possesses several other useful properties for object detection. Drawback of HOG tool is that it does notadjust to the invariant in orientation of the images. SVM is used as machine learning classifier for this application.

SVM was chosen as it works efficiently for high dimensional images. Drawback of SVM is it does not work on large number of datasets. Four classifier were compared by running a dataset of 100 images. But SVM attained a accuracy of 80%-90%. To detect a target building hidden within a larger image, the image is cropped into multiple overlapping cells with identical aspect ratios. Overall, the results are very encouraging, and they demonstrate that landmarks can be accurately identified from an image using a basic classification algorithm. An accuracy as high as 90% is attainable using a relatively small sample size.

This paper is [4] Evaluation of Image-Based Landmark Recognition Techniques, Author[1]: Yutaka Takeuchi. Recognizing landmarks in sequences of images is a challenging problem for a number of reasons. First of all, the appearance of any given landmark varies substantially from one observation to the next. In addition to variations due to different aspects, illumination changes, external clutter, and changing geometry of the imaging devices are other factors affecting the variability of the observed landmarks. Finally, it is typically difficult to make use of accurate 3D information in landmark recognition applications. For those reasons, it is not possible to use many of the object recognition techniques based on strong geometric models. The color values are resampled using a standard equalization. Specifically, the histogram of color values is divided into eight classes of roughly equal numbers of pixels. The color image is then coded on eight levels using those classes Edges are computed using Deriche's edge detector, and edge elements are linked and expanded into line segments. The input image is a 160x120 normalized red image. Five histogram features are computed from the edge image. This registration problem can be made tractable through a few domain assumptions. First of all, the interest is in landmarks that are far from the observer. Second, let's assume that the images come from video sequences taken from a moving vehicle looking forward or from a transverse observer.

III. WORKING MECHANISM

The entire system is divided in three basic modules namely,

- i. User module
- ii. Client module
- iii. Image processing system

First, the users are requested to login so as to categorize clients and App users. The user is asked to click an image which is temporarily stored in the phone memory before being transferred. The image is then transferred to the database for processing. The file transfer occurs under MQTT protocol standards. The database consists of knowledge base which helps in comparison process. Feature extraction concept comes in handy when efficient matching is needed. Image is compared with all the images in the database to assure close to accurate results. Homograph is applied on the server side and it terminates when comparison process completes. After getting a match, the reference ID of the matched image is followed to the database to prepare the information for transfer. The data is then passed on to the phone on the same connection along with the image.

Concurrently, a client standalone application will be provided for entrepreneurs and small establishment owners. The application is a fill-in form simple to understand which will help them update information in real-time. Overall, any establishment can be scanned and information can be gained.

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

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Vol. 7, Issue 5, May 2018

IV. PROPOSED SYSTEM ARCHITECTURE

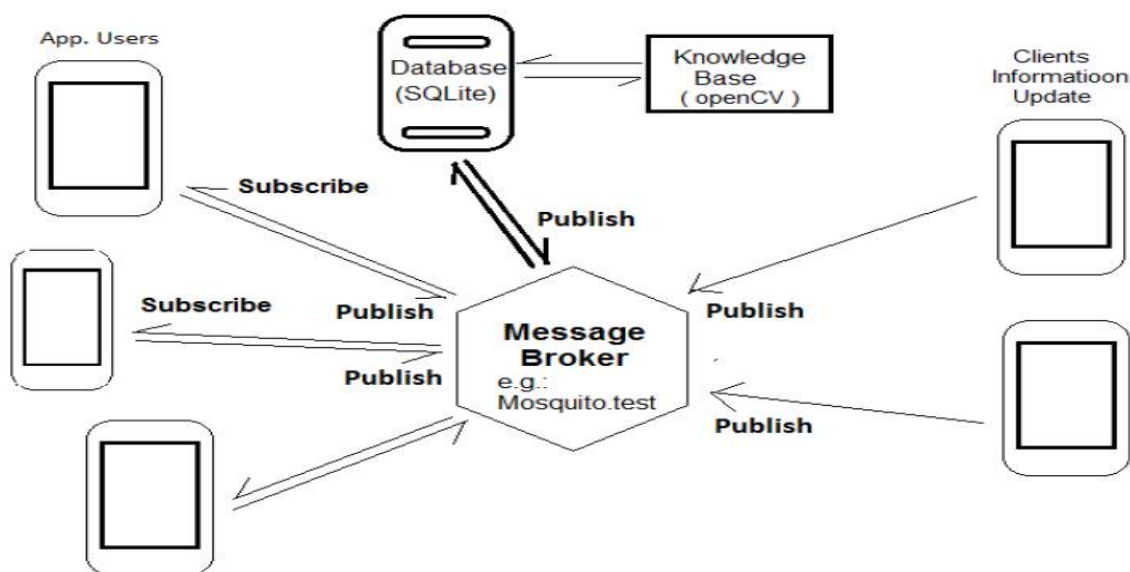


Fig No 01. Proposed System Architecture

The entire system runs on MQTT protocol for communication. The image from the user and the data updated by the client is concurrently transferred to the SQL Database through the message broker.

V. MQTT PROTOCOL

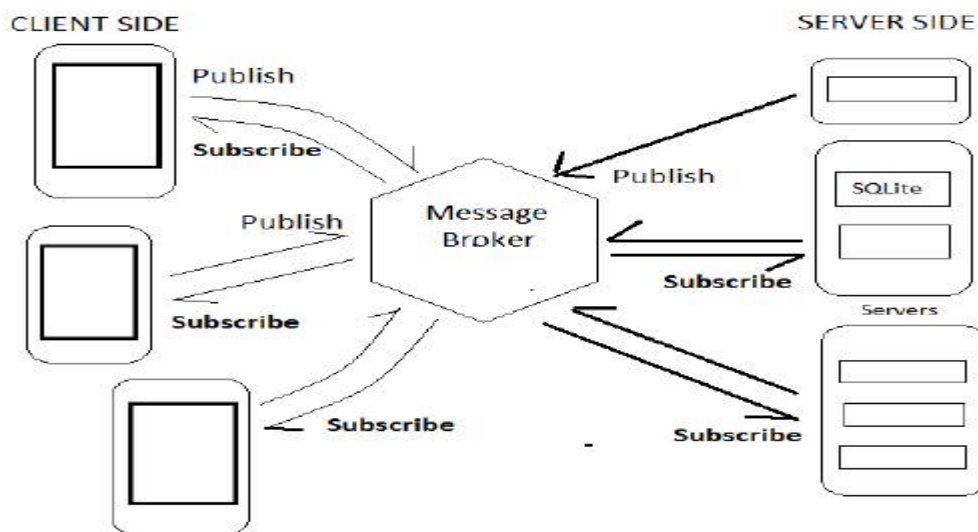


Fig -2: Working of MQTT Protocol

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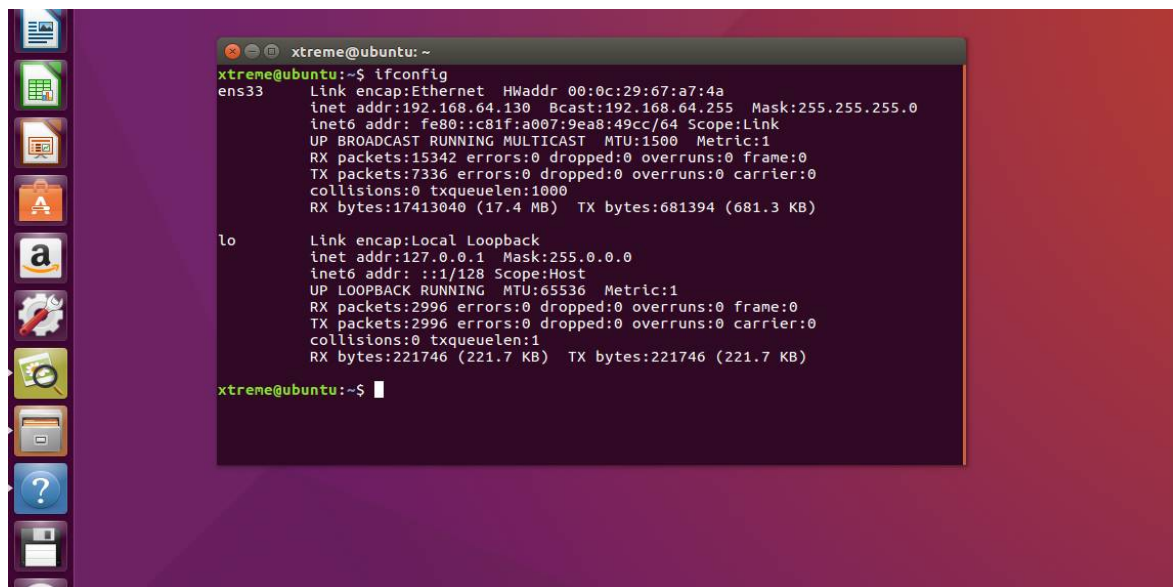
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It was developed by IBM and is open source for developers. It works on publish-subscribe methodology. The user subscribes to a topic and the server publishes such topics continuously. Entire process is handled by the Message Broker. Publish-subscribe is a messaging pattern where senders of messages, called publishers, do not program the messages to be sent directly to specific receivers, called subscribers, but instead characterize published messages into classes without knowledge of subscribers. Similarly, subscribers express interest in one or more classes and only receive messages that are of interest, without knowledge of which publishers. Deep learning algorithms were considered as traditional methods before the development of similar and more efficient algorithms. Homography is one such example which is much faster. It works on monochrome images and performs pixel to pixel matching. It is open source and developed in OpenCV

VI. RESULT



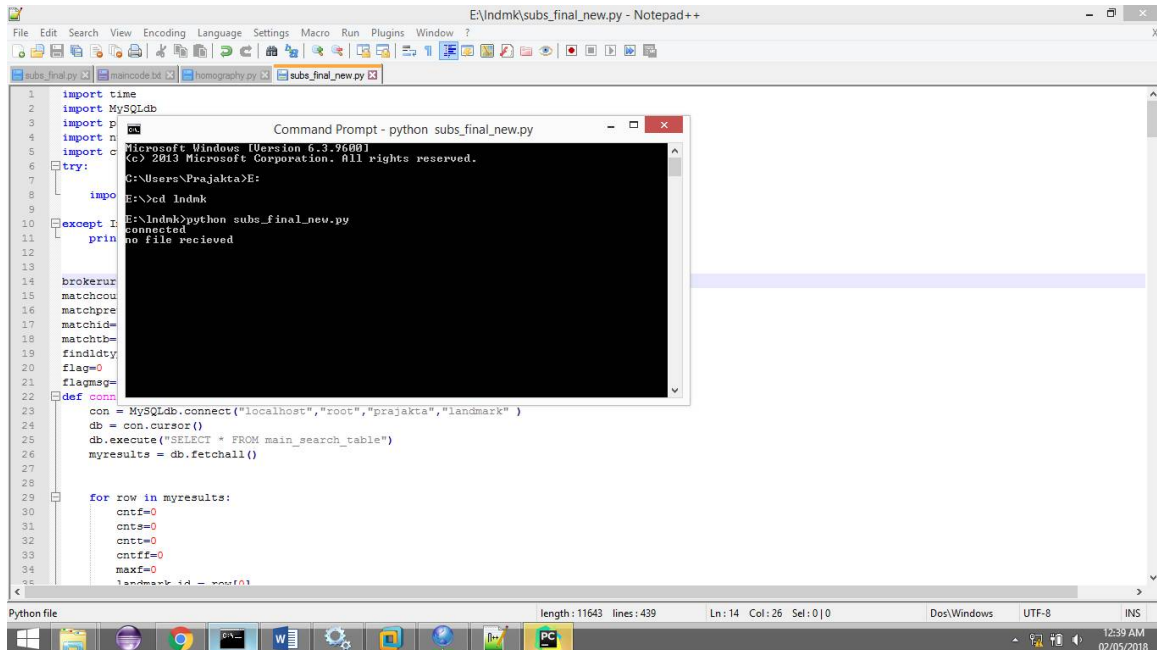
```
xtreme@ubuntu: ~  
xtreme@ubuntu:~$ ifconfig  
ens33      Link encap:Ethernet  Hwaddr 00:0c:29:67:a7:4a  
           inet addr:192.168.64.130  Bcast:192.168.64.255  Mask:255.255.255.0  
           inet6 addr: fe80::c81f:a007:9ea8:49cc/64 Scope:Link  
           UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1  
           RX packets:15342 errors:0 dropped:0 overruns:0 frame:0  
           TX packets:7336 errors:0 dropped:0 overruns:0 carrier:0  
           collisions:0 txqueuelen:1000  
           RX bytes:17413040 (17.4 MB)  TX bytes:681394 (681.3 KB)  
  
lo         Link encap:Local Loopback  
           inet addr:127.0.0.1  Mask:255.0.0.0  
           inet6 addr: ::1/128 Scope:Host  
           UP LOOPBACK RUNNING  MTU:65536  Metric:1  
           RX packets:2996 errors:0 dropped:0 overruns:0 frame:0  
           TX packets:2996 errors:0 dropped:0 overruns:0 carrier:0  
           collisions:0 txqueuelen:1  
           RX bytes:221746 (221.7 KB)  TX bytes:221746 (221.7 KB)  
  
xtreme@ubuntu:~$
```

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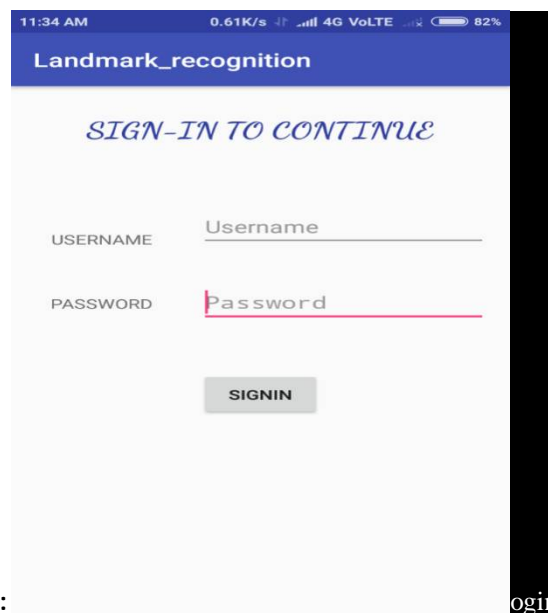
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```
1 import time
2 import MySQLdb
3 import sys
4 import os
5 import re
6 try:
7     C:\Users\Prajakta>E:
8     E:\>cd Indnk
9
10 except:
11     E:\Indnk>python subs_final_new.py
12     connected
13     no file recieved
14
15 brokerur
16 matchcou
17 matchpre
18 matchid=
19 matchtb=
20 findidty
21 flag=0
22 flagmsg=
23
24 def conn:
25     con = MySQLdb.connect("localhost","root","prajakta","landmark" )
26     db = con.cursor()
27     db.execute("SELECT * FROM main_search_table")
28     myresults = db.fetchall()
29
30 for row in myresults:
31     cntf=0
32     cnts=0
33     cntif=0
34     maxf=0
35     landmark_id = row[0]
```

Login page:



11:34 AM 0.61K/s 4G VoLTE 82%

Landmark_recognition

SIGN-IN TO CONTINUE

USERNAME

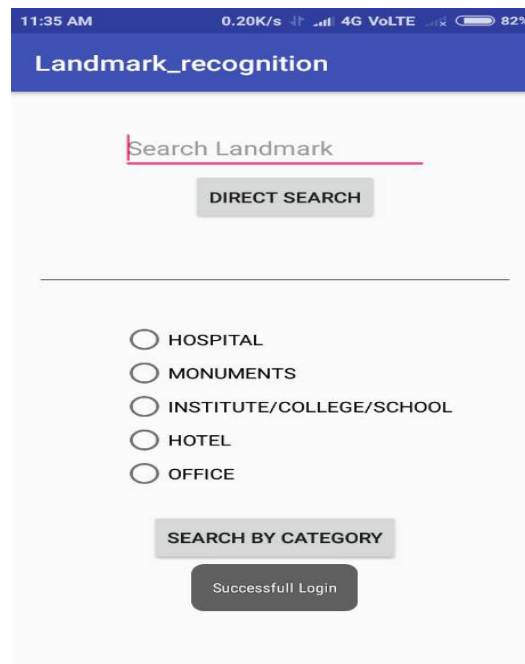
PASSWORD

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

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VII. CONCLUSIONS

In the future, other feature extraction methods can be looked at that may give better accuracy but require fewer dimensions. An algorithm will also need to be developed that can automatically search and obtain data from a database. The project can ultimately become part of the back-end code for a feature-recognition smartphone app. Also, a major affecting factor for the same is the transmission of data across the network. MQTT over TCP/IP is found much more effective at present for quick transfer of messages even on a giant scale but further researches can be made for attaining maximum flexibility and boost the transactions for better real time O-T-G experience. By using uniqueness in the picture, the time required by the app to recognize any picture will be less. This will also help app to attain high accuracy in terms of result. This app can be used in future in term of augmented reality to know the shape and structure of a particular building or monument. Even it can be used to recognize object which are used in our daily life.

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ISSN(Online): 2319-8753
ISSN (Print): 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 5, May 2018

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