Implementation of Quality Watch Android Based Application for Monitoring Robotic Arm Statistics Using Augmented Reality

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Abstract - *An intelligent System is developed which can keep monitoring the glass glazing process and make the effective use of technology. The automation will help to increase the effectiveness of the robotic arm and the app will keep a real time watch on the complete process. Initially, the picture of the robotic arm will be captured using the camera of the mobile phone with the help of mobile application. The complete analysis of data will be stored at the cloud i.e. recognition of number of faulty glasses, total number of glasses and finally the stored data retrieved by the user as per his requirements. The system will improve the user experience by allowing the user to view real time status of glass glazing process by giving the daily statistics.*

Key Words: Cloud Computing, Android Application, Augmented Reality, Industry 4.0, Robotic Arm, Data Virtualization.

1. INTRODUCTION

In the recent years internet has emerging from the network of computer and servers which connect the larger no of devices. This progress is termed as of internet of things(IOT). Telecommunications networks are day by day growing in scale and complexity, and the amount of information and services provided in the efficient manner. Predictions says that this growth will slowly continue, some other claiming that up to 50 billion devices will be connected to the Internet by 2020.

Hence, focusing on the new technology in Industries it is very important to introduce the new methods so that there will be improvement in the technology and also it will help in the progress of effectiveness in the product development by reducing the time. Actually Humans are not replaced by the robot but we need some assistance of machine to do some supplementary tasks and make the co-operation between the human and the robots to save some time. This will be done by the use of cyber physical systems, which made advancement in various sector like health care, emergency response, traffic flow management, and electric power generation and delivery and many more areas. CPS technologies include many interesting things like internet of things, smart grid, smart cities which makes smart anything which deals with the machine related things.

Here this project concentrate on the use of CPS in the manufacturing industry using the industry 4.0 concept. Basically we are doing the implementation which is based on the glass glazing process by building the Augmented reality application using a Smart phone to determine the use of a Robotic Arm in the glass glazing process.

1.1 Industry 4.0

Industry 4.0 like a revolution in the phase of manufacturing .It give the new path for the many machine related activities .Until now the Product, market and technology is keep shrinking and manufacturing companies are facing many challenges, but by applying the knowledge of the industry 4.0 and the IOT made everything very easy and simple, flexible, efficient and maintained the standard quality of working.
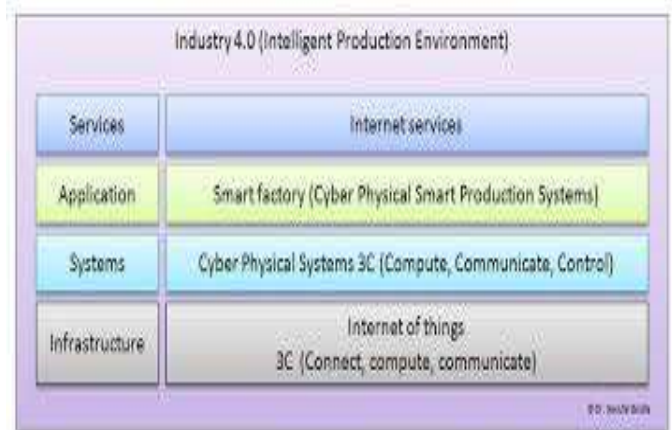

Fig - 1: Layered Architecture of Industry 4.0

1.2 Augmented Reality in Industry 4.0

Augmented Reality is one of the best technologies in the industry 4.0 trend when we speak about the Smart Manufacturing and Monitoring system. We are just imaging this technology few years back but now it actually exist and we are making use of it. It is used in many other manufacturing facilities to make surrounding productive.

Fig – 2: Augmented Reality in Industry 4.0

2. CHANGING TRENDS IN THE INDUSTRY

Many company realized that customer are not want to give the large price for the incremental quality improvement so many companies decided to make their production customer oriented so customization of product is done so companies have started so methodologies like Agile Manufacturing and Mass Customization companies unite their core competencies[6]. Cyber physical system made possible the advance communication between the human and machine. Boundaries of companies deteriorate, as autonomous systems exchange data, gained by embedded systems throughout the entire value chain[6]. By including Cyber-Physical- Systems, advanced communication between machines is tantamount to their dialogue with humans. The increasing utilization of information and communication technology allows digital engineering of products and production processes alike.

3. AR IN ANDROID APPLICATION

Augmented reality (AR) refers to the integration of additional computer generated information into a real world environment. Most current AR application computer graphics into the user´s view of his current surroundings. AR applications have high potential to improve the user experience of applications in which users must access and interact with information that has a direct spatial relation to their immediate environment[7]. Technological advances, especially with mobile devices, have removed some of the central technological limitations in recent years. Using this, the focus is to develop an AR android application that can provide the basic functionality such as the status of the last 5 products, no of defective products, no of processed products etc.

4. LITERATURE SURVEY

4.1 Need Of Augmented Reality and Monitoring:

For storing the real time data databases are required so that online storing the data is the best option which we can able

to do with the help of cloud[1]. All the data generated after the processing of the status monitoring is stored on the cloud for that we have to consider the detailed knowledge of basic cloud concepts[1]. For developing any AR application we have to consider its architecture and specific requirements to be fulfilled. Here the general overview of the application is considered [1]. Regarding this paper we have used AR concept for providing service in the field of production by choosing ARVIKA approach for object detection. It helps to give quality enhancement in development and process lifecycle[2]. Industry 4.0 is embedded in the concept of AR development process. As far as the development of AR app is concern the application augments the industrial robot. In the earlier steps the recognition of robot is done by recognizing different styles and the structure. For this we have used the Vuforia platform[3].

4.2 Need of Vuforia Service:

In this paper we have used vuforia model which is used for recognition of objects by their shape.It is used in the smart industry for building the visualization apps.It links the data points and with the help of this data points it becomes easy to identify the structure of object[4].It provide the best AR experience for large amount of devices and give a live environment for identifying different things[4]. With the help of 3D models we can easily detect and track the object with the help of this Vuforia platform. Now it is not limited to the specific fields, it is used widely in the every field sector. It really helps to boost the existing workflow.

4.3 Need of Spring Boot Service:

Here we have implemented spring boot which gives good facility like faster way to run the stand alone application[5]. There is no need to generate the code and also not require the xml configuration. It provide the functionality through well known familiar platform like java so there is no confusion to understand the code and writing the code[5].

5. IMPLEMENTATION

5.1 CREATING A SERVER SIDE APP STRUCTURE

Developing a multi-module spring boot project using REST API of modules namely,

1. Model
2. Controller.
3. Persistence.
4. Service.

5.1.1. Model:

Models of the user details and api key are declared.
The user details like id, name, login, password, session_id, last login, etc are declared with its appropriate data type.
The api key details included id, last_login, duration, etc.

5.1.2. Controller:

To controller the web service REST API are created to map the avail the services from service layer. Here we create request mappers like:
@RequestMapping(qualitywatch/devices/{devicesId}).

5.1.3. Persistence:

It contains only the interfaces to communicate with the databases. The communication of service layer object with the database is being handled. MongoDB database is used in this project. MongoDB starts on the server 127.0.0.1:27017 which has to be initialized in this module. As spring has mongoDB dependence which should be included in the gradle file and directly the in build function of CRUD operation on mongodb database can be used.

5.1.4. Service:

All the service provided to the user like login authentication, api key generation, etc. The service layer implements the interfaces of persistence layer to communicate with the database and avail the required service.

5.2. CLIENT SIDE IMPLEMENTATION(Android Application)

5.2.1. Creating Android Application using AR Framework:

Step 1: Installation Of JAVA: The application is to be developed in Java as it is much flexible and Platform independent.

Step 2: Creating a Gradle Project: The project is build using the GRADLE build tool as it is much simpler and efficient than other available build tools like ANT and MAVEN.

Step 3: Vuforia SDK setup: We need to setup vuforia SDK to use the vuforia service of storing database. The interface and methods and classes defined in vuforia SDK can be accessible which would make the programming simpler for using vuforia service to handle .DAT file which stores feature points of target image.

5.2.2.Setting up Vuforia Database:

Step 1: Creating a License Key: We create a license key for creating database in vuforia. Without license key we are unable to create database and we cannot add the target images in database.

Step 2: Adding Target Images on Vuforia: Vuforia contains a target manager where our target images are stored. The target images are rated according to the featured points. This target images includes .DAT file that contains it description and this files are integrated in our project.

Step 3: Creating Overlay Structure: When target images is encountered on AR screen a transparent an overlay structure is displayed that contains small blocks of text i.e info of target image encountered.

Step 4: Integrating License Key into Application: Generated licence key is integrated into application for the access of the database access. Without that we can't access the data.

5.2. Connectivity between Client(Android Application) and Server:

The Server site can be hosted on a website or a cloud service like AWS(Amazon Web Services) The client has to be programmed to GET the JSON object that are being sent as RESPONSE. Those JSON object need to be parsed and displayed on overlay screen as required.

RESULTS:

Fig -4: AR Application running on Android phone

3. CONCLUSIONS

As the need of Android application to monitor the robotic arm in the Smart Factory using augmented reality is fulfilled by the use of REST service and AR based application. The need to monitor the robotic arm details remotely is satisfied by the use of the Android based application proposed above.

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