

Model to Manage Amenity of Business with Android and Robotics

Vidyanand

(Associate Software Engineer, Mindbrowser Info Solution Pvt. Ltd. Pune, India)

vidyananddac13@gmail.com

Abstract :- With the advancements of robotic technologies, the industrial environments are adopting more and more aspects of automation to enhance product quality and accuracy. This model will show one of these aspects is the use of Automated Guided Vehicle (AGV) which is gaining importance in enterprise resource planning systems. As commercial ERP package is difficult to accept in terms of small and medium size companies, only large scale companies are using this package. To implement ERP package Application approach for small and medium size companies, we are further extending ERP system by using android integrated AGV and android device. Also we are providing android Application for employee with their own credential according to their designation and authority. The purpose of this project development is to integrate the business transactions as per customer's requirement. By providing portability with the help of Android based mobiles/ tabs the transactions will be made open and easy accessible to the end users. An OS-Android makes system wide usable, secure, and easy operative and upgradable. The users can download the client from the market places.

Keywords: - Android, Automated Guided Vehicles, Enterprise Resource Planning System

I. INTRODUCTION

We are in the 21st century, age of smart phones which has changed the definition of mobile phones. Now day's phone is no longer just a purpose of communication but also an essential part of the people's communication and daily life. Various applications added unlimited fun to people's lives. It is certain that the future of the network will be the mobile terminal. As the smart phones and Android system getting popular, operations like listening to music, watching videos, games and many others are moving from the computer to a smart phone. Android mobile Application development can be used to create innovative and dynamic third party Applications. Mobile development in India has worked extensively on projects ranging from gaming software, organizers, media players, picture editors to go-cart devices and many more.

Today many big, small and mid-sized organizations are implementing Enterprise Resource Planning (ERP) solutions to manage the business plans and policies not only in efficient but also in effective manner. An ERP solution allows our organization to utilize available resources in optimum manner.

Keeping this in mind we come up with an innovative idea of integrating ERP system with the hardware. The robots (An automated guided vehicle) can be attached to the Android Application for automating physical and virtual transactions at advance levels. It will provide functions to simplify the transactional, managerial, marketing and resourcing aspects of the enterprise by constructing an ERP system to oversee these modules which will aid in increasing the productivity, efficiency and marketability of the store allowing the enterprise to be competitive. Further the system is extended by using Web Server which provides the web services to the employees in companies and also the owner. Using Web server it makes employees to manage the data online and increases the efficiency of the system. Owner is provided with the Android Application so that he can access the information and gets the updates of companies everywhere.

II. OVERVIEW OF ANDROID

Android is a mobile operating system based on Linux Kernel and designed primarily for touch screen mobile, tablet, computer, TV, car, wrist watches. It is developed by Android Inc. which was founded in Palo Alto, California, further Google acquired in 17th August, 2005. The first released of Android device was 23rd September, 2008 and latest released on 2nd December, 2014 with version 5.0.1 Lollipop.

2.1. Architecture of Android

Android is a stack of software that includes an operating system, middleware and key Applications. The Android architecture consists of four layers as shown in Fig. 1, [1].

- Linux Kernel
- Libraries and Android runtime
- Application framework
- Application

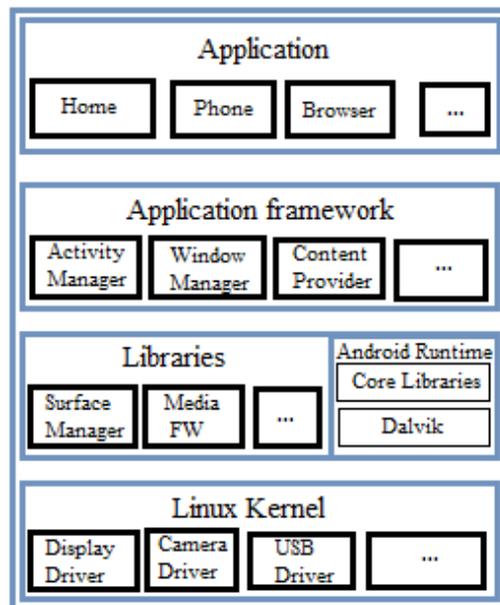


Fig. 1 Architecture of Android

2.1.1. Linux Kernel

The kernel system service provided by Android inner nuclear layer is based on Linux 2.6 kernel. Operations like internal storage, process management, internet protocol, bottom-drive and other core service are all based on Linux kernel.

2.1.2. Libraries and Android runtime

The library is divided in to two components: Android Runtime and Android Library. Android Runtime is consisted of a Java Core Library and Dalvik Virtual Machine (DVM). The Core Library provides Java core library with most functions. Dalvik Virtual Machine (DVM) is register virtual machine and makes some specific improvements for mobile device. Android system library supports the Application framework. It is also an important link connecting between Application framework and Linux Kernel. This system library is developed in C or C++ language. These libraries can also be utilized by the different components in the Android system. They provide service for the developers through the Application framework.

2.1.3. Application Framework

The developer is allowed to access all the API framework of the core programs. The Application framework simplifies the reuse of its components. Any other Application can release its functional components and all other Applications can access and use this component (but have to follow the security of the framework). Same as the users can be able to substitute the program components with this reuse mechanism.

2.1.4. Application

Android Application will be shipped with a set of core Applications including client, SMS program, calendar, maps, browser, contacts, and others. All these Application programs are developed in Java.

III. ERP SYSTEM

ERP system as shown in Fig. 2 is a system which links all areas of company including order management, manufacturing, human resources, financial system and distribution with external suppliers and customers into a tightly integrated system with shared data and visibility. It is considered as one of the complete business software in today's competitive environment. An ERP solution allows us to have an integrated view of all our Business Processes and other sub-processes which further allows efficiency and effectiveness in achieving our business goals [2], [3].



Fig. 2 Enterprise Resource Planning

a. Benefits of ERP for our Business

- **Integrate all business processes:** To realize the full benefits of an ERP system it should be fully integrated into all aspects of our business from the customer facing front end, through planning and scheduling, to the production and distribution of the products we make.
- **Automation increase productivity:** By automating aspects of business processes, ERP makes them more efficient, less prone to error, and faster. It also frees up people from mundane tasks such as balancing data.
- **Increase performance:** By integrating disparate business processes, ERP ensures coherence and avoids duplication, discontinuity, and people working at cross purposes, in different parts of the organization. The cumulative positive effect when business processes integrate well is overall superior performance by the organization.
- **Performance Analysis and quality reports:** Analysis on ERP will enable us to produce financial and boardroom quality reports, as well as to conduct analysis on the performance of our organization.
- **Integrates across the entire supply chain:** A best of breed ERP system should extend beyond our organization and integrate with both our supplier and customer systems to ensure full visibility and efficiency across our supply chain.

Generally, there are three types of enterprise resource planning software vendors to choose from in the Large Enterprise, Mid-Market and the Small Business ERP Market. Here, initially we come up with the idea for mid and small enterprise market. So, the main goal of this paper is to integrate the business transactions as per

customer's requirement. By providing portability with the help of Android based mobiles/tabs, the transactions will be made open and easy accessible to the end users.

IV. MODELS

Following are the two models designed to achieve efficient enterprise resource planning –

a. Stand-alone Version [SV]

It will consist of same features like in RV system except robotic and hardware sensory modules. To record daily transactional data from the company this model is used. It is used by the employee to store, retrieve, and update and also to manage the data but this model is not satisfactory model for efficient ERP system. So, we will focus more on RV model.

b. Robotic Version [RV]

An innovative idea to integrate ERP system with hardware. Robots (An automated guided vehicle) can be attached to the Android Application for automating of physical and virtual transactions at advance level. Fig. 3 depicts more about RV version.

An automated guided vehicle will man oeuvre inside a plant. It can pick up the materials from one place and by carrying it to the desired destination it will unload the materials. Here, a device operating android will be mounted on it. When AGV picks up the material transaction will be either automatically entered or manually entered by the operators into the main data server (centralized data server of the company). A server can be cloud database or a physical server. At the same time, authorized end users who are present outside company's location or even working in some other plant can interact with centralized system and also with the AGV to perform the transactions [4].

The RV Android Application model will also have AGV related configuration and settings. It can also interact with external hardware to collect inputs from various sensors and devices. It can keep the records of the transactions. The process can also be automated completely with the help of various sensors. It will perform-quality checking, pick and place jobs, MIS report printings, data logging etc.

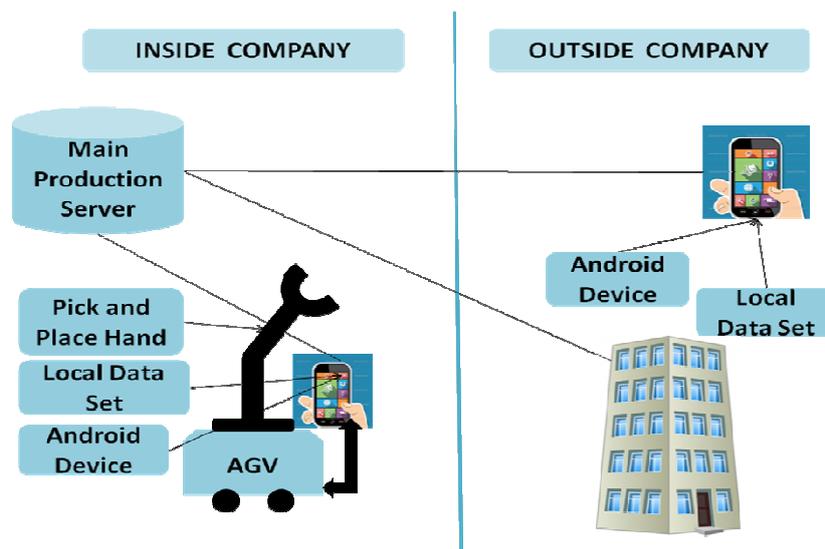


Fig. 3 RV Version Model

V. CLIENT SERVER CONNECTIVITY

Server will have a list of all clients. From the client side it needs to send a request to establish a connection as shown in Fig. 4. Below are the steps for connectivity-

SERVER Listing of Clients

CLIENT CONNECT to server

SERVER IDENTIFY client and REPLY

CLIENT CONNECTION establish

SERVER WAIT for REQUEST

CLIENT REQUEST for SELECT, UPDATE, INSERT, DELETE etc.

SERVER APPLICATIONROVAL of REQUEST, look for updated DATA and pending REQUEST, send WAIT message to the client in case previous REQUEST are pending or send DATA/ ACTION against DATA REQUEST, ACK to CLIENT

CLIENT Receive ACK and show UPDATE data

In case of mobile communication the communication will be highly dependent on the device in range. Through data synchronization process transactions can be handled in proper manner.

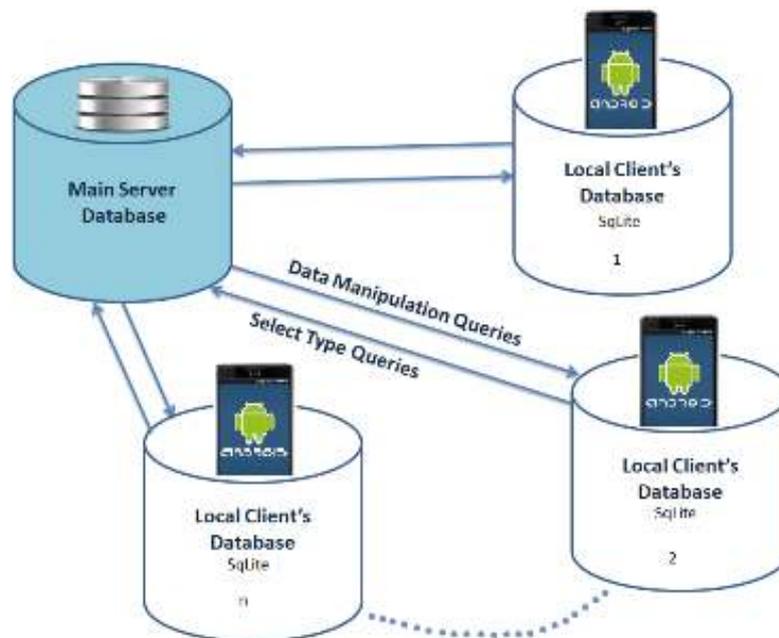


Fig. 4 Client – Server Connectivity

A main server will be kept at the centralized location and in case of large establishment a proper server network will be established. The data will be stored at the server location which can be stored in cloud, local etc and the preferred database will be oracle.

VI. AGV

AGV is an automated vehicle in motion and it stands for “Automated Guided Vehicle”. It’s normally mean mobile robots used in transporting objects. In our model AGV will come with the Android device and as per the conversion of another android device it will do any activity. The AGV system provides all of the routine product movements to support a retail distribution center using a person to goods picking strategy. In this AGV model we are coming with three types of AGV systems [5], [6].

a. Material handling manipulator

Manipulators which emulate the characteristics of a human arm are called articulated arms. The common industrial manipulator is often referred to as a robot arm, with links and joints described in similar terms. Material handling manipulator is a robotic device used to manipulate material without direct contact.

b. Pick and place system integrator

An automated guided robot is an enabling technology for flexible manufacturing, allowing production lines to readily accommodate product changes. In addition to locate parts for pick-and-place or to guide a robot to assemble components, machine vision can also inspect, measure, and read linear barcode and Data Matrix codes as products are being handled or assembled.

c. Quality check and control

Laser camera combination technology is ideal for many industries, including the ones mentioned earlier. A camera detects a laser line projected onto an object, and then a triangulation calculation determines height and width. Many industries have Applications that require smooth, sealed surfaces without gaps, ruts, or protrusions. These industries include glass, metal processing, plastics, tire, automotive, aerospace, and even highway road construction. When it comes to meeting the needs of these different industries, quality checks and process control based on measurement play a vital role.

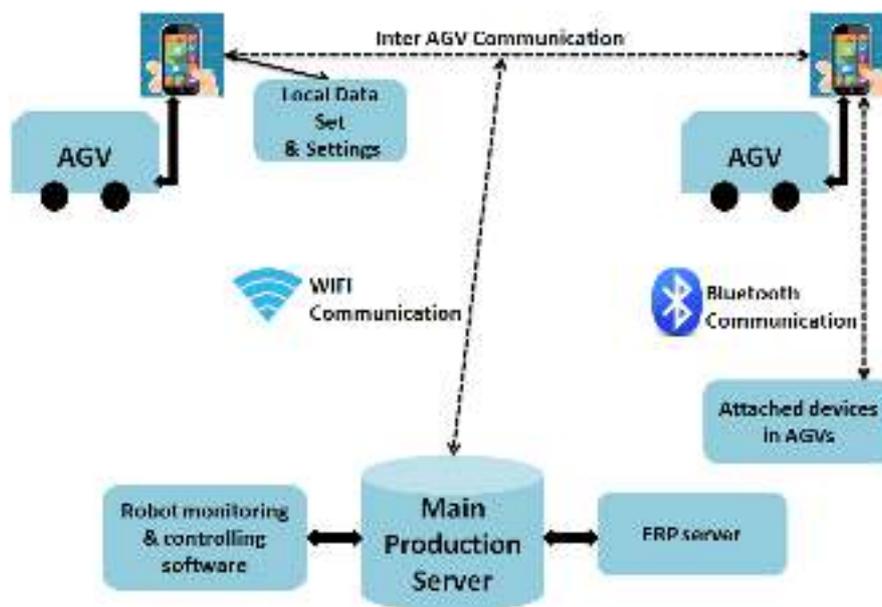


Fig. 5 AGV and Android Application integration

Integration scenario of Android Application and AGV system is shown in Fig. 5. AGVs are connected internally with each other with the help of Robot Monitoring and Controlling software. The software will be installed in the server and there will be a plug-in to connect to the Android Application system if required. The data updating between server and individual robot clients (android devices) will be established with the help of WIFI communicators. And communication between robot (AGV) sensors and android devices will be done using Bluetooth. There can be numerous sensors attached to perform physical operation and collected data can be sent to the Android Application-client and collaboration of all such client's data will be sent to the Android Application-server (central database).

VII. CONCLUSION

In this android Application model we used AGV robotic integrated with android to manage the ERP system. This model currently focusing on mid level and small level company, our in-plan module is Material

Management, Sales and Distribution, Material inventory. A customer can get comprehensive solution to perform various business transactions being inside or outside company. It will reduce clustering time and improve clustering accuracy. The communication between the internal resources will be fast. Any vendor or customer can order their requirement using the Application. Data storage and efficiency problem can be resolved by web server which our system provides with the web services to the AGV robotic, employees and the owner. We have also future plan with some module like Finance, Production Planning, Human Resource and Warehouse Management.

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