Communications on Applied Electronics (CAE) – ISSN : 2394-4714
Foundation of Computer Science FCS, New York, USA
Volume 5 – No.9, September 2016 – www.caeaccess.org

Location based Cocoa Farm Scouting System

Prince Yaw Owusu Amoako
Computer Science Department
Valley View University

Samuel Narter Tawiah
Computer Science Department
Koforidua Polytechnic

Martin Otu Offei
Computer Science Department
Koforidua Polytechnic

Seth Edumadze Edmond
Information Technology Department
Valley View University

ABSTRACT
Almost everything that goes on in this world needs an improvement, due to that, many applications and websites have been developed, to help the growth of farming sectors and the motivational level of the farmers, as a result of some information posted on the various pages of existing applications.

This project provides a mobile application to help locate cocoa farmers and their farm detail on a map.

A centralized database of farmers, is constructed to enable the ministry of agriculture and other government agencies, to monitor the activities of registered farms, how to manage the distribution of incentives to registered farms and to aid in preventing the smuggling of cocoa by some farmers in the country. This system is therefore, to enhance the growth of the farming industry.

General Terms
Farm Scout, Location Based Service, Cocoa Farm.

Keywords
Farm Scout, Location Based Service, Cocoa Farm.

1. INTRODUCTION
The State of Food and Agriculture 2014: Novel methods in family farming analyses, family farms and the role of innovation in ensuring global food security, poverty reduction and environmental sustainability state a concern. It argues that family farms must be supported to innovate in methods that encourage sustainable intensification of production and improvements in rural livelihoods. Innovation is a process through which farmers increase their production and farm management practices.

It is proposed in research that the growth of farming industry can be greatly enhanced with a location based systems (Marshall, Patrick, October 18, 2013).

Ina Freeman and Amir Hasnaoul, ABD (2010) defined Information and Communication Technology as the various communication networks through which information is carried at phenomenal speeds, such networks allow the transfer of massive amounts of information in a matter of seconds, enabling humankind to advance in multiple ways. These multiple ways also include the important field of farming under which information technology needs significant implementations.

2. LITERATURE REVIEW
The continuing rapid development of telecommunications and computer-based information technology (IT) is probably the major factor for modification in extension, one which will facilitate and reinforce other changes in farming and farm operation and management. There are many possibilities for the prospective applications of the technology in agricultural extension (FAO, 1993; Zijp, 1994). IT will offer novel information services to rural areas over which farmers, as users, will have much greater control than over current information channels. Irrespective of the fact that every farmer does not have a computer terminal, these could become readily available at local information resource centers, with computers making available expert systems to help farmers to make decisions. However, it will not make extension workers redundant. Rather, they will be able to concentrate on tasks and services where human interaction is indispensable - in assisting farmers individually and in small groups to detect problems, to interpret data, and to apply their meaning (Leeuwis, 1993).

There exist a number of innovation in the mobile/IT and energy spaces that will go a long way to make a huge impact on the farm. A few of such examples are the smart power systems, precision agriculture tools, farm management software, and affordable sensors which are all within reach of even the smallest farmers today.

When these technologies are deployed effectively all of the above mentioned technologies will work towards achieving the following long-term objectives. Efficient farm management and resource efficiency, traceability and supply chain efficiency (Christiana, 2013).

Information communication technologies come in great varieties and organized ways with the unequivocal objective of resolving explicit problems from particular fields. As Kroeker and Yonck (2010) put it: "The use of computers and technology today has become fundamental to the operation of organizations and society", in Ghana just like in most of the emerging countries, technology devices and applications are given great consideration, the reason being their uncontestable ways of making populations' life easier in such an aggregate manner. Multiple sectors have been greatly influenced by the insertion of information communication technologies in the everyday life and tasks of companies and populations as a whole.

Theunissen (2015) states that as agriculture makes up a large proportion of Africa's GDP, the boost of agricultural growth and sustainability is a priority and ICTs have the potential to support agricultural development in poor countries by functioning as innovative solutions to agricultural challenges. Agriculture might be a relatively new area for the ICT sector to think about, but it is an important one.

Communications on Applied Electronics (CAE) – ISSN : 2394-4714
Foundation of Computer Science FCS, New York, USA
Volume 5 – No.9, September 2016 – www.caeaccess.org

3. TECHNOLOGY AND FARMING IN GHANA

Different sectors have been really given great values as to how technology can better life, of those who directly operate there, unlike in developed countries the farming sector is not given the same technological attention, the reality remains that the influence of ICT on the farming sectors in Ghana is still far behind the technological development, that other developing countries are experiencing nowadays. For almost all the unindustrialized countries, farming is the first largest source of GDP revenue to the Government, but it is of no surprise to learn that the actors in the farming sector, are less taken care of and less considered. Despite the government effort to provide the registered farming groups with technology enabled tools, the truth is that the promises do not in most cases match the actions presented to the farming communities. In Ghana we have two types of farming groups, the small scaled farmers which produce for family and the large scaled farmers for commercial purpose.

4. LOGICS BEHIND THIS CONCEPTS AND TECHNOLOGIES

In order to develop location-based service system for farmers and farms, the location APIs, protocols, technologies and infrastructure of LBS must be understood and reconciled. We consider these in this section.

4.1 Technology of Positioning

There are several ways in which positioning is done such as Global position system (GPS), and most GPS receivers will present their current latitude and longitudes. The usual format for presenting this information is in degrees and minutes. Terrestrial position (Position on the Earth) by its latitude and longitude.

Further system location is the use of telephone network. This segment deals more on how mobile network project location on their device based on positioning, the Global System for Mobile Communications (or GSM). GSM is a digital mobile telephony system that is widely used in the world. GSM uses a variation of time division multiple access (TDMA) and is the most widely used of the three digital wireless telephony technologies (TDMA, GSM, and CDMA). GSM digitizes and compresses data, then transfers it down a channel with two other streams of user data, each in its own time slot. GSM is the leading digital cellular radio network. While the current GSM system was originally designed with an emphasis on voice sessions, the General Packet Radio Service (GPRS). These technologies are found to be appropriate in this study because of challenges associated with access points in rural areas in Ghana with respect to internet services.

4.2 Positioning Methods

Cellular base system is the most commonly used location services in all the networks. This method of location expands to its subscribers within its range. This method uses tessellation of a flat surface that is the tiling of a plane by means of one or more geometric shapes, called tiles, with no overlaps and no gaps. It contains details on the position of its gaps base on the ID of the device. Base Transceiver Station (BTS) facilitates wireless communication between device and a network. People in the rural areas have low signal due to the network range as compared to urban centers. Hence this method may be considered more required.

4.3 Positioning and Location API

Before location of a particular cell phone is detected all devices and subscriber identity model (SIM) have a track identity that enables network providers to track it when it is activated.

The purpose of the mobile location protocol (MLP) is to delimit a simple and secure access method that allows Internet applications to demand location information from a wireless network, irrespective of its location interface technologies and positioning method.

5. SYSTEM ARCHITECTURE

This section presents the design and architecture of the system.

To use the Farm scout System, a smart phone that supports jquery mobile and javascript was installed for accessing the application. The application would have to be connected via the internet to the server.

As presented below, the figure 1 shows the login interface, figure 2 depicts the main interface of the system and figure 3 the location of farms on a map.

Fig 1: Login

Fig 2: System

Fig 3: Farms map

The system operation is supported by a backend interface as shown in figure 4 below.

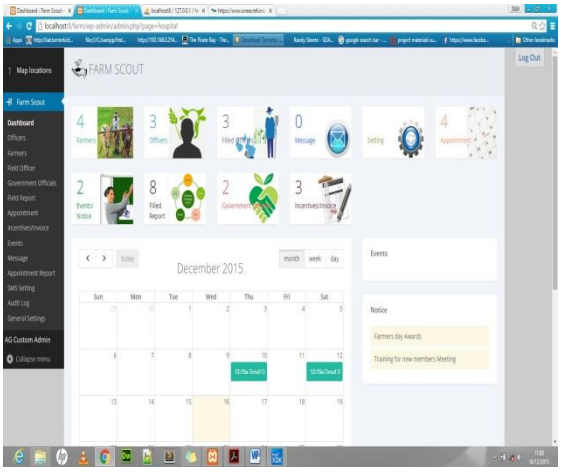

Figure 4. Backend of the system

The simulator and location-based service application are built on intel xdk with html5 platform and php which also requires a web server to run on and a database to store details related to the location. In this application Apache Tomcat is used to support the component in the web part as well as MySQL to store data. The client side of the application is based on mobile information 2.0 across all platforms. A user having a mobile device to handle information (all platforms) will be able to download the device client application from a network and execute them on their mobile devices. The simulator used (Intel XDK) has a connection to mimic real-time location data from network.

MySQL to store the simulated location data as well as details of the entity located. The request may be served by several asynchronous location responses (until a predefined timeout limit is reached). This service used request-response messages known as Standard Location Immediate Request (SLIR) and Standard Location Immediate Answer (SLIA).

The following steps outline the interaction between components in the system.

1. The client application installed on a mobile device. The location API support map display, the type of map satellites, road traffics, menu for map, indicators for information, zooming. The user identity as well as verification codes to allow users.
2. When client application is installed users receive notification base on the user type.
3. Method of request is validated against user type during signing in. If all checks pass, the simulator connects to the positioning database and retrieves a random location data of the mobile id. The positioning data are stated in latitude and longitude decimal degrees. Nevertheless, if errors any made during user authentication and request reject the retrieval of information or returned to the dashboard instead.
4. The Intel XDK simulator consists of location data and other elements such as radius, local time. It classifies the language type as ‘text/html5’ and writes the SLIA contents into opened HTTP connection from the application service provider.
5. After response message, the location service application uses the URL connection to the Multimap server with the location data. The map will be read from URL.
6. The location service (google API) application customizes the format and size of the map to be suitable for the device’s characteristics, and then sends it to the mobile user. If an error message is obtained from simulator, the service will not launch a map request; instead it will forward the error message directly to client application.
7. PHP was used to connect the frontend and backend to the database of the system. Most of the information displayed on the backend were called from the database using php.

6. DEPLOYING OF CLIENT SIDE APPLICATION

The client side application and its component is packed into a format in which all devices are able to use.

There are two ways in which this application can be installed and run. Either the application (apk) is gotten on the devices and run directly or downloaded to be installed.

The desktop side also uses the same made downloading the executable file to be installed using the desktops approach.

The method of installing the package over a network is known as SHAREit or OTA provisioning. SHAREit provides works as follows. First a mobile phone sends a WAP request for a file to a Web server through a WAP gateway. The Web server sends APK package to the mobile phone. Then the phone fetches the APK package file from the Web server. The phone then install the application due to its cross platforms.

The figure 5 below is the section which enables connection to the database "farm”.

```
15  */
16
17  // ** MySQL settings - You can get this info from your web host ** //
18  /** The name of the database for WordPress */
19  define('DB_NAME', 'farm');
20
21  /** MySQL database username */
22  define('DB_USER', 'root');
23
24  /** MySQL database password */
25  define('DB_PASSWORD', '');
26
27  /** MySQL hostname */
28  define('DB_HOST', 'localhost');
29
30  /** Database Charset to use in creating database tables. */
31  define('DB_CHARSET', 'utf8');
32
33  /** The Database Collate type. Don't change this if in doubt. */
34  define('DB_COLLATE', '');
35
36  /**#@+
37   * Authentication Unique Keys and Salts.
38   *
```

Figure 5: PHP database connect.

JQuery mobile was the main language used in building the mobile application platform of the system. Its main function was to make the mobile application responsive and accessible on smartphones, tablets and desktop devices. The figure 6 below is a snippet of codes for textboxes and checklists which are filled to enable the Administrators to communicate to the frontend.

This is done by linking the URL of the farm data to the intel xdk for them to communicate.

Fig 6: Ajax code for connecting to a PHP page

7. PROJECTIONS

We want to project that the implementation of this system will help decrease the smuggling of cocoa from Ghana to neighbouring countries for about 85%. This is because all the greater and vast cocoa farms and farmers will be captured and tracked based on the size of the farm and the projected quantity of produce.

Not only this, but also the system will minimize the distribution of farm incentives by the government to unauthorized persons for about 75% on our estimation since the system will call for recording of all distributions. The government can obtain a report on the distribution in order to monitor the distribution activities.

8. ACKNOWLEDGMENTS

In our effort to ascertain the number of cocoa farms, we have developed a system which captures the details of the farm and farmers in addition to the support from the government.

We therefore, conclude that a system with both stand alone and mobile features is desirable and that implementation of it will significantly assist the farmers and stakeholders in improving the operation and minimization of fraudulent activities to the detriment of the growth of the economy of Ghana. This will be extended to other critical areas of the economy such as mining sector etc.

Besides the sample API for the map there are many API to be used to make work efficient and effective for the location of areas. Other platforms can be used for the development of this system which require further research.

9. ACKNOWLEDGMENTS

Our thanks to the experts who have contributed towards the bases of this work by providing the platforms for us to come up with this solution paper.

10. REFERENCES

[1] Adekunle, A. & Fatunabi, A. 2012. Approaches for setting-up multi-stakeholder platforms for agricultural research and development. World Applied Sciences Journal, 16(7), pp. 981–988. http://www.wikihow.com/Get-A-Government-Grant-For-A-Farm

[2] Ebenezer, B. (2005, October 10). Features: ghana web com. Retrieved January 11, 2015, from Ghana Web Website: http://www.ghanaweb.com/GhanaHomePage/features/artikel.php?ID=91779

[3] Elvin, M. (1973). The pattern of the Chinese past. London: Methuen.

[4] FAO (1993). The potentials of microcomputers in support of agricultural extension, education and training. Rome: FAO.

[5] Garforth, C. (1986). Mass media and communications technology. In G. E. Jones (Ed.), Investing in rural extension: Strategies and goals (p. 185-192). London and New York: Elsevier Applied Science Publishers.

[6] José Graziano da Silva, FAO Director-General , (2014) The State of Food and Agriculture Retrieved from:

[7] Lauren Servin , (May 30, 2012), How Our Government Incentivizes the Overproduction of Junk Food. Retrieved from http://www.rooseveltinstitute.org/new-roosevelt/how-our-government-incentivizes-overproduction-junk-food

[8] Farm Registration Act. 1994-95, c. 3, s. 1. Retrieved from: http://nslegislature.ca/legc/statutes/farmreg.htm)

[9] Statistics, Research and Information Directorate (SRID), Ministry of Food and Agriculture (2010) Retrieved from: http://www.farmergps.com/hardware.htm

[10] Laitinen, H., Cellular Location Technology, CELLO project report, 2001. http://www.vtt.fi/tte/tte35/pdfs/CELLOWP2- VTT-D03-007-Int.pdf

[11] Hightower, J., & Borriello, G., "Location systems for ubiquitous computing", IEEE, August 2001, 34, (8), pp. 57-66

[12] Bing, B. Wireless Local Area Networks: the New Wireless Revolution, Wiley-Interscience, New York, Chichester, 2002.

[13] Battiti, R., Nhat, T.L., & Villani, A., "Location-aware computing: a neural network model for determining location in wireless LANs", Technical Report DIT-02-0083, February 2002 http://eprints.biblio.unitn.it/archive/00000233/01/83.pdf

[14] Roos, T., Myllymaki, P., Tirri, H., Misikangas, P., & Sievanan, J., "A probabilistic approach to WLAN user location estimation", International Journal of Wireless Information Networks, 9(3), July 2002.

[15] Ladd, A.M., Bekris, K.E., Rudys, A., Marceau, G., Kavraki L.E., & Dan, S., "Robotics-based location sensing using wireless Ethernet", Eighth ACM Int. Conf. on Mobile Computing & Networking (MOBICOM), Atlanta, Georgia, US, 23-28 September 2002, pp. 227-238.

[16] Theunissen, I. (2015, November 26). E-agriculture: How ICT is taking farming into the future. Retrieved from BIZTECH AFRICA: www.biztechafrica.com/article/e-agriculture-how-ict-taking-farming-future

[17] Christina. (2013, JUNE 13). The Impact of Technology in Agriculture. (Invested Development) Retrieved from investeddevelopment.com/blog/2013/06/the-impact-of-technology-in-agriculture

[18] Marshall, Patrick. (October 18, 2013). GIS becomes indispensable for mapping agriculture.

[19] Theunissen, I. (2015, November 26). E-agriculture: How ICT is taking farming into the future. Retrieved from BIZTECH AFRICA:www.biztechafrica.com/article/e-agriculture-how-ict-taking-farming-future