

IT – A Tool for Development of Digital City

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ABSTRACT

Concept of Digital City is a hot topic of research. With the advancement of information technology and internet, development of Digital cities has become very easy and it has lead to the sustainable development of cities. This paper describes the term Digital City, its need, its worldwide progress, efforts required to expedite the growth of Digital Cities and in the bargain growth of “Digital Earth” and use of digital concepts by the researcher.

Keywords

Digital City, Digital Earth, IT (Information Technology), ICT (Information Communication Technology), RFID (Radio Frequency Identification, PDA (Personal Digital Assistant)

1. INTRODUCTION

Digital city is a dynamic concept whose definition is still evolving. Digital cities can be seen as an effort to develop and use IT applications for the improvement of the local and urban infrastructure for living, working, collaboration and communication within a networked society. The main aim of Digital City is to make the life of people comfortable and improve their quality of life by providing them various city services and provide better management services. Digital cities have been developed all over the world and can be connected to each other via the internet just like physical cities are connected by surface and air transport systems. In digital cities people in communities can share knowledge, experience and mutual interests. Digital environment encourages communication between people from different cultures.

2. DEFINITION

Digital City is a metaphor [1]. It is observed that various terms have been used for digital city e.g. Virtual City, Wired City, City of Bits, Web City, Webbed City, Electronic Town, Digital Town. It is very difficult to elaborate an accurate definition of the digital city. We have tried to see the concept of Digital City from computer science and information Technology perspective. How experts from computer science and IT can contribute in the development of Digital Cities by using modern technologies, so that life of people can be made easy by providing them various facilities/ information at any time, any place and at the same time they should not feel isolated/lonely from the society.

A Digital City can be defined as a node in Digital Earth which is a network of information. A Digital City is an open and complex application system based on internet technology and modern information technology. Its aim is to achieve sustainable development of the city by developing various services like tourism, health, environment, transportation, sports, education etc.

3. Why Digital Cities?

Population growth, urbanization, and global warming are fueling an increasing focus on the challenges facing the world's cities. As the global population heads towards 7 billion, accommodating the future billions will require cities that make smarter use of resources to deliver more with less.

Information technology is an important enabler of a more sustainable approach to designing, building, and operating cities. Digital city's main aim is transformation of cities and urban areas through the use of modern technologies to provide interactive city-wide services, which provide information and transactions to governments, citizens and business.

Development of Digital Cities has become essential because of

- Increasing importance of the automated/processed information.
- Increasing gap between citizens, i.e. disappearance of public places where people can meet and discuss and also increasing gap between the citizens and their government.
- The problem of inefficiency of public administration.
- Increasing competition in the global market.
- Immediate satisfaction of customer needs.
- Need for a new model of management within the administration.

According to Graham and Aurigi (1997) our cities are faced with loss of real public space. Digital cities may be considered as an attempt to build new electronic public spaces and find back some characteristics of the cities, i.e. places of communication, interactions, offering a lot of economic, social and cultural opportunities (Graham and Aurigi 1997). Moreover cities are competing with each other on commercial level in order to attract investment and tourists.

Another fact about the evolution of physical urban space and digital cities is the deepening integration of one into the other. As business centers become telecommunication nodes, electronic public spaces are increasing and building turn into network interfaces equipped with electronic sensors and sophisticated telecommunications capabilities, the interaction between digital city and physical city is stronger and stronger. “Buildings and parts of building s must now be related not only to their natural and urban contexts, but also to their cyberspace settings (...). Rooms and buildings will henceforth be seen as sites where bits meet the body(...). The buildings will become computer interfaces and computer interfaces will become buildings” (Mitchell,1995, pp: 104-105).

4. WORLDWIDE PROGRESS OF DIGITAL CITIES

Many experiments have taken place and are still taking place all over the world, showing a large variation. Some are developing advanced cutting edge technologies; others use established and well known technologies. Some are mainly technological projects that aim at demonstrating the potential usefulness, while others are mainly social development projects, using the technology as an instrument for supporting the development of deprived groups, neighborhoods or regions. Some are very resourceful, whereas others are low budget initiatives. Finally, where some digital cities are merely (temporary) experiments, other are meant as sustainable part of the local infrastructures.

The idea of using technology to bring together communities is not new and already emerged in 60s and 70s with the beginning of local free radios and Community TVs and newspaper [2]. Free nets and on-line communities that first appeared in the United States in the year 70s can be seen as extension of the free move initiated by free radios and community TVs. The idea continued of using new media to provide local content made by citizens, to (re)create a social link and offer a place for free expression.

Table 1: Important dates in the story of digital cities

60's	Emergence of the idea of 'wired cities' in the States and of the concept of local radio and TV, i.e. of the use of 'new' media for building communities
70's	Realization of wired cities projects in the States and in Japan
1972	First demonstration of ARPANET (Internet ancestor)
1974	Creation of the first community network (Community Memory) in Berkeley
1980	Creation of the first community-based BBS (Old Colorado City)
1986	Creation of the first Free-net in Cleveland
1989	Creation of the PEN (Public Electronic Network) in Santa Monica
1990	First implementation of the World Wide Web * Creation by US local authorities of cities Web sites (ex. Palo Alto)
1993	Launch of Mosaic, software that allows the vulgarisation of the Web * Publication of the "NII: Agenda For Action" in the USA

Source: Adapted from Marie d'Udekem-Gevers (1998), "Les 'Villes Numérisées' : entre discours de l'Union européenne et initiatives locales spontanées en Belgique francophone", à paraître dans les Actes du 11ème colloque européen en informatique et société "Informatisation et anticipations: entre promesses et réalisations", Strasbourg, 10-12 juin 1998, p. 4.

5. EFFORTS REQUIRED FOR THE DEVELOPMENT OF DIGITAL CITIES

Digital cities are smarter than average cities and create services, infrastructure and environment in which digital society flourishes. It provides new ways for government, municipal authorities and private sector companies to build more efficient

infrastructure and services. Efforts required for the development of digital cities include:

- Provision of broadband through wired or wireless medium, internet connectivity and integrated systems in all spheres of city's activities. It is a prerequisite infrastructure for a digital city.
- Government should ensure that all public services like
 - Bus Services
 - Local Train Services
 - Appointment with doctor
 - Status of books in library
 - Availability of various facilities in various hospitals
 are available on phone which will increase productivity and reduce unnecessary travel.
- Government should publish its city policy and planning on line, so that citizens can participate in urban planning discussions.
- Government should encourage the installation of ICT infrastructure and energy efficient technologies in new building developments.
- New applications need to be developed to operate traffic lights to control real time traffic flow, help people to plan their journeys, find car parks, and decide to take public transport instead of driving. E.g.
 - Cars driving in same area build a local ad-hoc network for fast exchange of information in emergency situations or to help each other keep a safe distance.
 - In case of an accident, not only the air bag is triggered, but the police and ambulance service should be informed via an emergency call to a service provider.
 - The possibility of an ambulance with a high quality wireless connection to a hospital. Vital information about injured patient can be sent to the hospital from the scene of accident. All the necessary steps for this particular type of accident can be prepared and specialists can be consulted for an early diagnosis.
- More health care products need to be developed for remote diagnosis, tele - health, in home monitoring of medical conditions and on line consultations via video.
- Development of e-content for online education and minimize the need to travel for education. Encourage the use of ICT, online access to educational resources and improve collaboration between students, teachers and parents.
- Creation of technology intensive business, research and development clusters, special economic zones, or technologies to attract and stimulate the growth of hardware and software intensive industries.
- All the leading developers should be well aware of the commercial benefits of improving efficiency in the construction industry and reducing the materials and energy costs of buildings. They should implement building automation systems to reduce energy consumption.

5.1 ACTORS/INGREDIENTS OF DIGITAL CITY

The actors play different roles in digital cities. They could be initiators/leaders who have the original idea of the project, support providers (governments, industry, cities and citizens) provide financial support, technical support or organizational support, managers –responsible for day to day activities, associations and voluntary bodies and the commercial and private companies. According to the different cases, their importance and influence on the development of digital cities will be different.

The advancement of digital cities requires that all the actors should work as a team for the development of digital cities.

5.2 CITY BUILDING TECHNOLOGIES

City building technologies include:

- Ubiquitous connectivity (always on) is same as rail and road infrastructure for physical connectivity. Access to high bandwidth reasonable priced internet and mobile network connectivity any time/any place.
- Any time anyplace devices to receive/send and collect data in real time.
- Collaboration of technologies such as voice, SMS and email messaging, calendars, office automation tools, online meetings and voice/video conferences. These platforms can increase the productivity of teams, enable remote working, and minimize the need for travel for meeting.
- Use IT as a service. E.g. Cloud computing to reduce the funding and technical knowledge required to implement new application.
- Free or low cost online geospatial platform such as Google Maps, Microsoft Bing maps combined with GPS and other location sensing technologies.
- Use of RFID, Wi-Fi and 3G networks along with internet for real time data.
- Open access to public data.
- Use of digitally controlled devices for real time control.
- Social networking-interactivity.

6. USE OF DIGITAL CONCEPTS

Digital City concept in its totality is a huge project and cannot be completed by an individual. Researcher being from the education field has developed a project to promote education digitally. This project finds applications in an environment where information can be acquired automatically. This information can be about a product in an exhibition or it could be information about an experiment in a laboratory required by a student. An attempt has been made to use Radio Frequency Identification (which is an automatic data collection technology) to make information available at any time and place for general public/students.

This project involves integration of RFID technology along with necessary software to read the data. The required interface has been developed for a pocket PC/desktop computer/server. A prototype has been developed to help the students to perform practical in physics laboratory using this technology.

Presently,

A batch of students attend practical in the physics laboratory as per the time table. The instructor guides the students about procedures to be followed while performing the experiment.

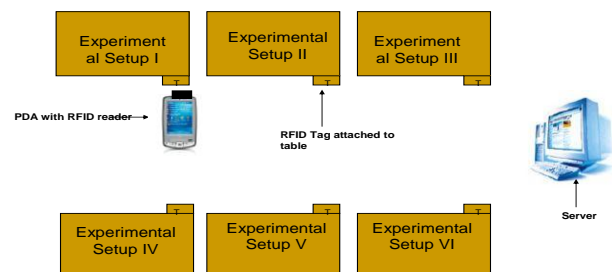
The student performs the experiment, and tabulates the readings, and draws inferences and the same is transferred in their journals to keep the records for final approval by the instructor.

Some of the students are unable to perform/understand the experiments to their full satisfaction due to various reasons like:-
“Time is short, the student is unable to follow the explanation given by their instructor, they would like to adopt self paced learning procedure”.

An experimental setup is arranged on a laboratory table. The following information about the experiment is stored in the department desktop computer/server

- Theoretical background about the experiment
- Step by step instructions about the experimental setup
- Procedures to be followed while performing the experiment.
- Any other relevant information about the experiment.

The table has a RFID transponder/tag attached to it. This tag carries the serial number (identification no.) of the experiment. A document pertaining to this serial no. is stored in the department computer/server. The student is provided with the PDA having a RFID reader attached to it. He walks to the table and puts the PDA in front of the RFID tag attached to the table. The students immediately get the information about the experiment on the PDA screen. Now the student can read the instructions from the PDA screen and perform the experiment.



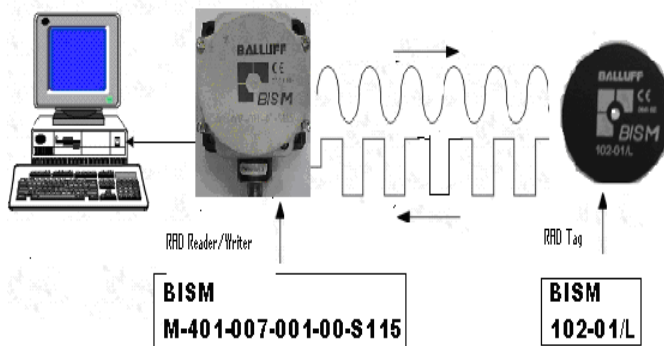
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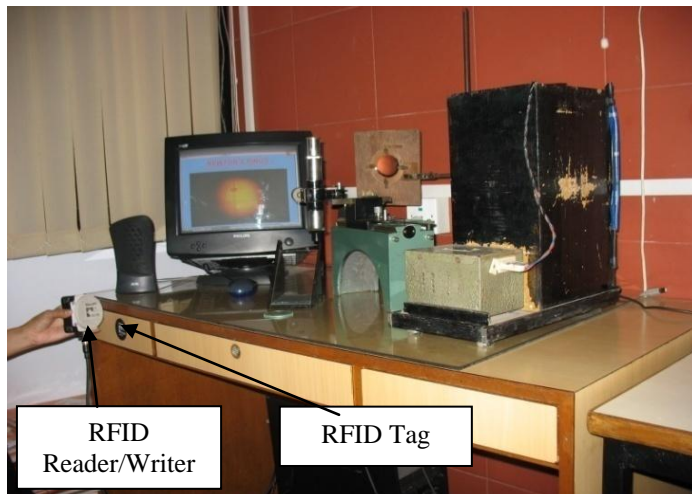
6.1 PROTOTYPE EXPERIMENTAL SETUP

An industrial RFID system of Balluff was available to the researcher, for experimentation. The arrangement of the system with this industrial setup is complete in all respect as far as the fulfillment of the idea is concerned, except the PDA is replaced by a desktop computer. The following industrial setup consists of all the components mentioned above.

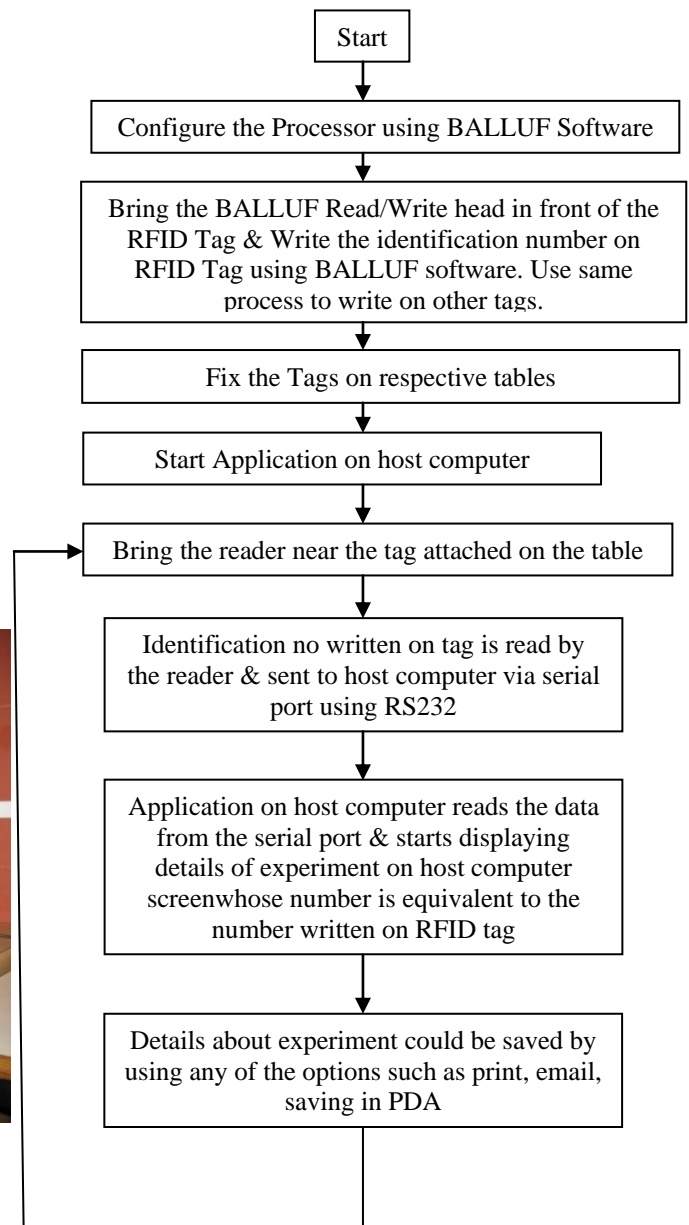
T. Ishida. Digital City Koyoto: Social Information Infrastructure for Everyday Life. Communication of the ACM (CACM), Vol. 45, No. 7, pp.76-81, 2002.



6.2 DEMONSTRATED PHOTOGRAPH OF ACTUAL RFID SETUP



6.3 FLOCHART OF WORKING



This method would overcome certain deficiencies in the present teaching method such as:

- Shortage of time, since students can listen to the instructions about performing the experiment again and again adopting this method.
- Bad student-teacher ratio, since student can utilize this method without the presence of the teacher and can perform the experiment.
- Use of animation would make the learning process attractive and interesting for the students.
- This method can be used as e-learning tool in other subjects also, which will make the teaching learning process paperless and attractive.
- Learning will become easy and students will be more comfortable and will become self dependant.

7. CHALLENGES

Because of high population growth there are challenges for the “build, customize, and own” model as cities are struggling to fund the rising costs of their dedicated ICT operations. Another challenge refers to the choice of technology in a context of rapid change, where technologies evolve more rapidly than the time required to develop the artifact.

8. CONCLUSION

Digital city systems will streamline and automate all aspects of the way citizens live. Careful thought need to be given to long term social policy. Digital cities can share ideas, strategies and solutions from other cities and can move fast. Internet platform and cloud computing is lowering the barriers to discover and use IT enabled services and solutions. All the actors of digital city need to work as a team for the fast development of digital cities. Professionals from computer science and IT need to come forward and work for the development of digital cities.

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