The Challenges and Prospect of OpenStreetMap in Bangladesh

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Abstract—**OpenStreetMap (OSM) is a world-wide campaign for developing open source maps. With the ever increase in the rate of cell phone usage, the necessity of location based services is increasing day by day and the prospect of such open source maps is very bright in commercial, educational and political points of views. Starting from the 3G mobile applications to cheap SMS-based services, we need maps everywhere. Various applications of digital maps are also seen in different national and international issues. Hence, OSM has been growing at a rapid pace in different parts of the world. However, it is a bit challenging task to develop this sort of voluntary efforts in the developing third world countries like Bangladesh. In this paper, we discuss the present conditions and initiatives taken for making OpenStreetMap a success in Bangladesh. Then we discuss about the various sectors that can be directly benefitted by the use of OSM in the context of developing countries like us and finally, we present the shortcomings and challenges that we face while developing OSM for this region.**

keywords : OpenStreetMap, Location Based Services, Bangladesh, Public Health, Volunteerism, Disaster Response System, Developing Countries.

I. INTRODUCTION

OpenStreetMap is, as the name suggests, an open source map of the world [1]. It has been built up in a concept similar to the Wikipedia [2]. It is called the free wiki world map, a collaborative project to create a free editable map of the world. A digital map has many important applications in various sectors. It can be used in navigations, in research, in development of location based applications, and in so many other disciplines. When the map is free, its usability is guaranteed for everyone. And as OpenStreetMap data is under *Creative Commons Attribution ShareAlike* [3], its development is very rapid and dynamic.

One special difference with OpenStreetMap and other commercial mapping services is the requirement for volunteers. The more volunteers work on it, the faster its development process runs. For this reason, OpenStreetMap is not equally advanced in all countries. In European and North American countries, OpenStreetMap shows a highly detailed map. But in Asia, Australia, and Africa, it is not that much developed yet. In Bangladesh, its condition is even worse, as the OSM movement has just started in here.

In the OpenStreetMap of Bangladesh, only the capital city, Dhaka and the port city Chittagong contains some detail, though in some places merely the large roads are visible. Apart from these two cities, the other cities contain a few scratches, but almost 99% of the country is completely unmapped, which renders OpenStreetMap unusable.

A rich, detailed map can be utilized in many ways. There are a number of initiatives taken by the Government to make detailed maps for different purposes, but those are not open to the public. Hence, the mass use of maps is not possible for this region. As a result, people here are being deprived of a great number of useful location based services.

We have organized this paper in the following sections. Section II presents a brief history of the OpenStreetMap project. The present condition of OSM in Bangladesh and the initiatives taken are outlined in Section III. Then we discuss about some major sectors which can be benefitted by the successful incorporation of OSM data in the context of Bangladesh in Section IV . We try to identify the major challenges that we face in Section V. Then we conclude our discussions in Section VII after presenting our future plan for making OSM a widespread tool for the general people in Section VI.

II. HISTORY OF OPENSTREETMAP

OpenStreetMap (OSM) was founded in July 2004 by Steve Coast [4]. In April 2006, the OpenStreetMap Foundation (OSMF) was established to encourage the growth, development and distribution of free geospatial data and provide geospatial data for anybody to use and share [4]. In December 2006, Yahoo confirmed that OpenStreetMap could use its aerial photography as a backdrop for map production [5].

OpenStreetMap has helped in a number of projects conducted worldwide. Among these projects, the MapKibera project [6] and WikiProject Haiti [7] drew worldwide attention. In the MapKibera project, Kibera, the largest slum of Kenya was mapped with full details. And in WikiProject Haiti, OpenStreetMap helped the rescue and relief workers in Haiti after the devastating earthquake of 2010 (Fig. 1). OSM community also actively worked for the flood victims of Brazil and Pakistan and the earth-quake victims of Japan in recent days.

In Bangladesh, the activities of OpenStreetMap started in 2010. Five GPS units were donated by the OpenStreetMap Foundation. Using those, the first mapping project was done at Bangladesh University of Engineering and Technology (BUET), the top engineering school located at the capital of the country. Later, another project was commenced to map the
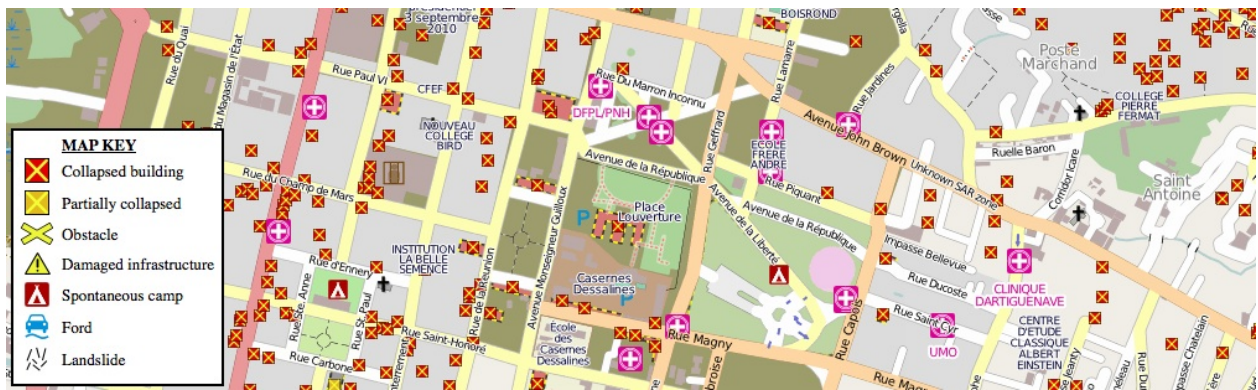
Fig. 1: OpenStreetMappers helped the relief workers in Haiti by building a digital map of the disaster affected area.

Fig. 2: Map of BUET in OpenStreetMap.

Fig. 3: OpenStreetMap of the Old Dhaka.

older portions of the capital. This project aims at identifying the positions of the buildings that are most vulnerable to earthquakes. A small group of enthusiastic students are actively working here for developing more maps for these regions and the OSM community is growing very rapidly in Bangladesh.

III. PRESENT CONDITIONS AND INITIATIVES

Since the inception of OSM community in Bangladesh, a small group of active participants are working voluntarily to make OSM a success here. A few projects have been completed, and some other projects are in progress. In this section, we will present the most notable ones among these projects.

A. Map BUET

This was the first OSM project done by the students of the Department of Computer Science and Engineering, Bangladesh University of Engineering and Technology (BUET). They took a number of waypoints with their Garmin GPS devices and made map of the campus using OpenStreetMap. Finally they donated the map to OSM (Fig. 2). This map was given to the freshers who joined the Department

of Computer Science and Engineering of BUET in February, 2011 (CSE 2010 Batch).

B. First Mapping Party

On February 21, 2011, the first mapping party of OSM BD took place in a small kindergarten school at Dhanmondi, Dhaka. This date was particularly memorable as this was the *International Mother Language Day*. Three presentations were made in front of a large number of enthusiastic audience in this party. At first, the lead of CommunityAction, a volunteer group helping OSM in Bangladesh, made speech on leadership and volunteerism. Then Syed Ishtiaque Ahmed explained the significance and necessity of OSM in Bangladesh. Finally K. M. Rakibul Islam, an undergraduate student of the Department of CSE, BUET showed the people about how to make maps using JOSM.

C. Mapping the Old Dhaka

Old Dhaka is the historic and ancient part of the Dhaka city. It is a very congested, crowded and over-populated place. The streets in this old town are very narrow and traffic jams are a common part of life. There are some very old and risky buildings in this part of the city which may cause

Fig. 4: A part of the CUET campus in OpenStreenMap.

severe accidents. Moreover, some catastrophic fire-accidents take place here in almost every year. Hence, the OSM group decided to map the Old Dhaka. In February 26, 2011, around 20 mappers in 5 groups covered different parts of the Old Dhaka and gathered GPS traces. They are now working with this data to make a complete digital map of the old town for the very first time. (Fig. 3) This project, once completed, will be considered as a milestone of the OSM movement in Bangladesh.

D. Mapping Sylhet City

Sylhet division occupies the north-east part of Bangladesh. It has an area of 12596 sq. km and a population of 7.899 million. There are 4 districts and 14 municipalities under Sylhet division. It is a natural hilly, forest area with Ox Bow lakes and famous shrines. Sylhet city is situated in the picturesque Surma valley amidst scenic tea plantations and lush green tropical forests. Greater Sylhet is a prime attraction for all the tourists visiting Bangladesh. To attract more tourists we are mapping Sylhet city's transport network, all tourist spots and available facilities in OSM.

E. Mapping at Chittagong

One of the 5 GPS units received from OSM Foundation was given to Chittagong University of Engineering and Technology (CUET), Chittagong, Bangladesh to start OSM there. A workshop on mapping was conducted there by Rifat Raashidujjaman and Subrami Moutushy. The mapper group of CUET has started uploading CUET campus map to OpenStreetMap (Fig. 4). They are trying to map all the way points from Chittagong city to the CUET campus. We are also mapping the Chittagong city which is uploaded to OpenStreetMap.

F. Mapping the Hill Tracts

The Chittagong Hill Tracts comprise an area of 13,295 square km in south-eastern Bangladesh, and borders India and Myanmar (Burma). It consists of three separate districts:

Khagrachari, Rangamati and Bandarban and the main residence of a few tribal indigenous groups, specially the Chakma people. These native people lags behind the main development stream and major initiatives are taken for their betterment by different government and non-government organizations. However, they lack a digital map to facilitate the aid work. The OSM community in Bangladesh has come forward to meet the requirement.

Two groups of students and faculty members from BUET and CUET are working in collaboration to complete two projects - one aimed at mapping the tribal villages in OSM and another mapping the major forests in that region. Once complete, we can expect that these two projects will provide vital assistance in the ecological and socio-economic development of the indigenous populations in the Chittagong hill tracts.

G. Mapping the Khulna Region

Khulna division is the home for the largest mangrove forest in the world and the residence of the world famous Royal-Bengal-Tiger. A team in Khulna University of Engineering and Technology (KUET) is being formed to map the area to identify and represent several local issues like salinity of water, the forest and its animals, etc.

IV. Use of OpenStreetMap in Bangladesh

Though the opportunities OSM opens are endless, in this section, we would like to list a few of them.

A. Public Health Sector

The Government in Bangladesh is working hard to ensure health cover for the general people of the country despite its limited resources. However, this endeavor can be more successful if we can take help from the digital mapping data that OpenStreetMaps can offer. In this sub-section we will describe a few of them.

1) Vaccination Clinic: Due to the lack of administrative coordination, normally vaccination camps for kids or any temporary specialized health services like eye-clinics are administered locally. As a result, it is a common scenario that the target groups for these health camps do not get timely announcements and remain unaware of such initiatives. In order to tackle this problem, location-based mobile applications can be quite useful. Technically this is possible because Bangladesh already has wide-spread coverage of cellular infrastructure and this telephony service is available at a very cheap rate.

In rural Bangladesh, many conservative or less-educated mothers do not get health services because they do not know the right location and time to avail those. OSM-based mobile application can be quite effective for them to access information on these health-care services.

2) Map of Permanent Health-Care Facilities: Like other third world countries, Bangladesh is still lagging behind in providing quality health-care services to her large population. This is more of a problem for people living in rural and suburban areas, who basically constitute the major part of the

countrys population. Part of the problem lies in the fact that, people are not aware of what health-care facilities are available in their neighborhood. OSM can be used to create a map showing hospitals, private health centers, diagnostic centers and pharmacies in those areas. This will keep people more informed and will help to get easy access to existing health care systems. Such a map will be very helpful for the people who lack proper health care. It will also help to identify the localities which require more attention from the Government or other concerned institutions.

3) Regarding Arsenic Hazard: The widespread incidence of arsenic contamination of water creates health problems for the mass people. Long-term exposure to low concentrations of arsenic in drinking ground water causes painful skin lesions and can result in cancers of the skin, lungs, bladder and kidneys. Tackling the problem means identifying who is suffering from arsenic poisoning (Arsenicosis), monitoring water quality of different places, helping communities to find alternative area of sources of safe water and pointing out the affected areas and tube-wells as well. OSM can play a vital role to locate all the arsenic affected water sources.

4) Ensuring Proper Nutrition: Over the last two decades, Bangladesh has achieved significant success to reduce her infant mortality rates [8]. But abnormal physical/mental growth of children and lack of work-efficiency due to malnutrition among the teenagers is a great concern for Bangladesh. For example, majority of the kids of northern Bangladesh suffer from iodine deficiency whereas the kids in the southern part mainly suffer from water-borne diseases. Health care providers and volunteers who work to eradicate these problems can work more effectively if a map with OSM can capture area-wise data on health-care needs for local kids. With the help of telecom operators, necessary tips and informations might be propagated to rural people.

B. Disaster Response and Management

1) Coping with Climate and Geographical Changes: Different parts of Bangladesh are susceptible to different diseases due to climate change and geographical reasons. For example, some of the northern hilly districts of Bangladesh like Rangamati, Bandarban, etc. are known for the spread of Malaria disease. Recently, many people in some northern districts suffered from Anthrax. OSM can be used to create district-wise maps depicting any such region and it will keep a traveler informed about possible health risks.

2) Health Care After Disaster: Floods may cause epidemic outbreak of water-borne diseases. OpenStreetMap can be used by the medical service teams to support people, just like the relief distribution teams. An important use of OpenStreetMap can be locating the hospitals and other medical services and the ways to reach them. If the data about the diseases can be collected and integrated with OpenStreetMap, it may show the density of people affected by a particular disease. This information may be useful to locate the places more vulnerable to epidemic diseases and take proper initiatives.

C. Helping the Disabled People

1) For Visual Impaired People: Though the path of visually impaired students in Bangladesh is not very smooth, it is certainly a good news that their number is increasing. But even after getting admitted to top universities, they are falling behind, merely because they can't move about all alone. A location-indicative cell phone can be as useful to them as eyes are to us. These cell phones will enable the visually impaired and physically challenged populace to develop into a productive workforce for our country.

2) For Handicapped People: Absence of ramp causes problems for disabled people in some locations. Knowing this information beforehand would enable them to make necessary arrangement with the help of local people.

D. Transportation Help

Rickshaw is a major transport for average people in Bangladesh but it has been banned in some major streets in Dhaka. This type of traffic information may change rapidly under the direction of the traffic control authority. A road map showing restrictions on rickshaw as well as other information like which streets are one way would help the city dwellers in their everyday life.

E. Pathfinder for the Volunteers

1) Location Aware Request for Volunteers: There are old homes, schools for the blind or deaf learners in many localities. If the location is known, when one wants to perform as a volunteer there, he can be informed by a text, message automatically; even a volunteer map can be created. Say for example, there is an old home in Gazipur, close to Dhaka. When a volunteer enters Gazipur, the map will inform him: you can spend an hour with the aged people, read them news from todays daily, or you can give them a chance to recall memories from their golden past- if you just get to that place.

May be the same idea can be applied as an alert message if there is a location of a shelter home for the blind: you can be their *eyes* for some time or you can help them writing Brail.

2) Coordination Among Voluntary Workers: In recent days, there are at least some volunteer organizations working in different areas of Bangladesh. However, their work is not mutually coordinated and they are unaware of which voluntary project is in effect in which area. As a result, there are cases that one area gets help again and again whereas many areas do not get help at all. Neither volunteers nor relief reach there. This has been the case in relief initiatives for recent natural calamities like the cyclone *Aila* in 2009. To avoid this mismanagement, volunteers need to show their working location in map after disaster as soon as possible. Similarly, they need to show the uncovered area too. Any unattended problem noted in the map can be solved later when another team will be there.

F. Effect of OSM Towards Young Generation

In an underdeveloped country like Bangladesh, its quite impossible to cover all area under OpenStreetMapping by

allocating donations. In this regard there is no alternative option of voluntary works. Local students from schools and colleges can be involved here. The spirit of volunteerism will build up their mind. The participation of young generation will develop different dimensions of their thoughts. Highest number of points can be considered in mapping through the young, as they themselves are well introduced with their residential areas. The intimacy with technology for young generations will make it easier for them by using the map. It can bring out new ideas as well. Finding out the nooks and corners of the student-campus from the map will be much easier for any new students.

G. Education Instrument for Deprived Kids and in Rural Areas

Internet is not available all over Bangladesh yet. While its more rarefied in rural areas, electricity and mobile-technology is much available along with few computer usages across the country. The privileged children from rural areas can easily enhance knowledge from Google search, finding information about movies, weather, public data, breaking news and much more through internet. If this knowledge based informative map can be reached to the orphanage and shelter homes as an electronic version, then it would be perfect example as educational element.

H. Tourism

OpenStreetMap will play a vital role in boosting tourism industry in Bangladesh, which has been able to attract tourists from all around the globe for her unique natural beauty. As most of the tourists come from the developed countries, they are heavily dependent on using digital maps and location based services. Popular map services like google maps have not developed complete maps for Bangladesh. But using our own resources, we can make a complete map in OpenStreetMaps and provide the tourists the information they require. Bangladesh Tourism Board can take some initiatives for the purpose and benefit the country thereby.

I. Identifying Point of Interests

Identifying point of interests (POI) has been a key aspect of digital maps since the inception of it, and Bangladesh will be no exception. If we have a complete map of the country, the key business and service points can be pinpointed and people can access information about them using GPS, cellular, or web based technologies. People will be able to find their nearest point of interest very easily and business will also be flourished by the use of OSM. The business community should understand the huge impact OSM can play on the financial sector and try to develop it as soon as possible.

J. Research

OSM can open many new dimensions of research for the local scientists. As the complete database is open and accessible to everyone, each researcher can tailor it to his particular need. Researchers from many disciplines will be benefitted from using OSM. From weather analysts to Geologists, Computer scientists to Zoologists, researchers from almost every discipline can find some applications of OSM in their related field. The opportunities are truly endless.

V. CHALLENGES

The challenges we face in Bangladesh has its own type and distinguished than the difficulties one may face in developed countries. There are several strong reasons behind this, some of which are listed below:

1) There are very few GPS devices used actively in Bangladesh. Very few people own a GPS device, because of its cost.
2) There is a lack of technically skilled volunteers for OpenStreetMap contribution. The lack of volunteers is the principle reason behind the the slow progress of OSM in Bangladesh.
3) Contribution in OpenStreetMap requires a moderately high speed internet connection, which is quite costly in Bangladesh. Most of the people use low-cost internet packages which suffice for browsing, but not good enough for viewing or editing OpenStreetMap quickly.
4) The concept of digital map is very new in Bangladesh and so people are not used to consult maps for their daily needs. They do not consider a map as an important gadget yet. This reluctance is also making the progress of OpenStreetMap slow.
5) 3G mobile phone technology has not been introduced to Bangladesh till mid 2011. So, the location based services are not provided by the telecom operators.
6) Software firms in Bangladesh mostly use the map services from Google and Yahoo for application development rather than making their own products. Under this situation, OpenStreetMap lags behind.
7) The Government of Bangladesh has not taken any imitative to promote open source development. All the actions on OpenStreetMap have been carried out by individuals or small groups.
8) OpenStreetMap can also be a great field of research for the academia. It can be used for surveying, data collection and many other ways. But in Bangladesh, the researchers apart from computer science background are mostly unaware about the usage of OpenStreetMap.

A comparison between Bangladesh and a neighboring country India can clearly indicate the situation. In the OpenStreetMap GPS traces database, there are only 25 entries from Bangladesh [9], where India has 531 [10]. The comparison was done using the number of search results found by using the country names as search tags.

VI. FUTURE PLAN

We need to build a large community of volunteers to make OSM a success in Bangladesh. The students from the universities can play a major role in this respect. Besides their academic activities, they can work for the wellbeing of the country and the people. Keeping this in mind, we are working

to start OpenStreetMapper groups in different public and private universities. There has been a strong dedicated group of volunteers in BUET from the very beginning. A good team has been formed in CUET and a group has started working in American International University Bangladesh (AIUB).

In the next two months (July and August, 2011) we plan to arrange a city wide mapping contest. We will divide the Dhaka city into some sectors and invite teams from different universities to map each of them. We will perform day long session on OSM in these universities and allocate them a fixed time to map their part of the city. We can give award to the best performing teams. This contest will serve two purposes. Some students from each university will get training about working with OSM, and they will get motivation for developing a OpenStreetMap when they feel that their work is recognized and useful for their countrymen.

Besides these, we need to expand the OpenStreetMap movement outside the capital. We plan to take the help of the Universities for this purpose too. There are public universities in almost every district of the country. We need to motivate and train volunteers from these universities. They will expand the movement in their locality and will involve the local people too. After all, OpenStreetMap is a map by the people, and for the people.

VII. CONCLUSION

The journey of OpenStreetMap has just started in Bangladesh. The prospect and possibilities of OSM here are endless. In this paper, we have presented our major initiatives so far and our future plan. We have also discussed about some important sectors where OSM can have major applications. If the Government, NGOs and the people work with hand in hand, OpenStreetMap can play a major role in improving the life-standard of the people living here and eliminate digital divide.

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