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SOCIAL NETWORK MODELLING: RETRIEVAL CORRELATED GRAPHS BY MOBILE PHONE'S CHRONOLOGICAL BILLING FILES

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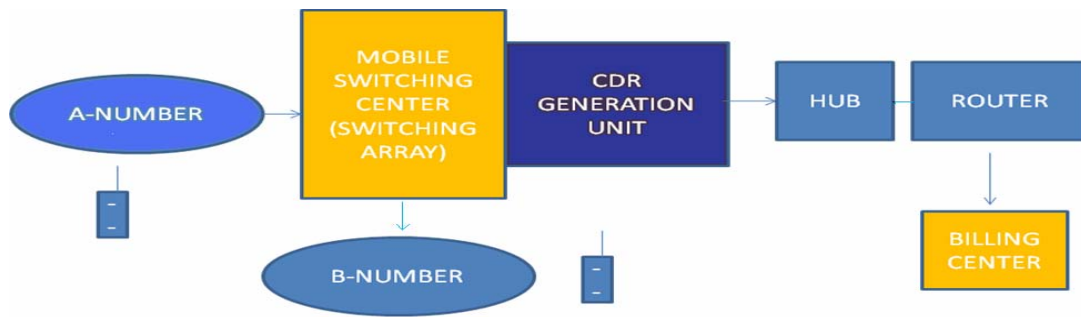
The extraction of information about behavior of individuals and communities is ongoing in recent years by using new devices to prepare life logs. We offer a method for make the social network by using the information of mobile phones which are registered chronologically in telecommunication corporations. Preparing the connection graph by this method is possible as well.

Data about activities of individuals by new technology are collected and estimated. Individuals who are frequently found together are likely to be associated with each other. Several models for constructing social network from events are proposed. Finding subgroups and subsets of criminal groups such as drugs and money laundering or terrorism, find suspects are stated in these researches [1]. The social networks are investigated in different groups and media and used to recognize and distinguish more strong or more week ties between members. The results are offered to assist the management to choice the suitable policies for future concerns [2] [3]. New wearable electronic badge enable people working in large organizations to communicate, find information, and interact in more efficient and intelligent ways. The badge will perform speech analysis and speech recognition using state-of-the-art devices. Infrared sensors are hired to capture face-to-face interactions and study social networks. Radio transceiver send and receive information from base stations distributed along a specific area and Bluetooth modules enable us to interface with cell phones, PDAs, portable computers. [4]. These equipments are employed to offer statistical models by data collection experiments such as HMM (hidden Markov Model) [5] [6].

Mobile phones are well suited for context-aware computing. On one hand, mobile phones follow the user, their various usage contexts will likely benefit from context awareness. As a result, this platform offers several useful capabilities and functions that existing platforms don't [7].

In some instances (MSNS) mobile social network system from one's mobile phone is evaluated [8]. Privacy, Sharing, and Interest (PSI) is one of the topics which has been estimated in peer to peer relations for creation a social network model by real time analysis of human preferences and behaviors by mobile devices for further applications [9]. Continuous behavioral data logged by the mobile phones compared with self-report relational data yields the information from these two data sources [10].

In this study we work on CDR files [11] to retrieve the connection detail of subscribers in a mobile switching center (MSC). CDR files (call detail records) are made by any switching system to prepare the billing information about subscribers such as call duration, originating and terminating numbers (A-numbers and B-numbers), furthermore origin and destination physical coordination are recorded. These files are worth investigation which can be used to prepare the connection graphs between subscribers that can be termed in social network as actors. So by transforming the latter files to text files and then changing them to a matrix it can be easily linked to the graph theory's fundamentals. Such aspect of social network can be easily disclosed by a few simple softwares. Our goal in this approach is review and construction the path between raw billing information and predefined social network norms.

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Fig.1 diagram of generation CDR files

Fig.1 indicates the process which is executed to make CDR files. The main target is transform these CDR files to graph and it can be done by prepared software which can make the adjacency matrices. As it is shown every connection establishment between 2 numbers those imply to the actors in social network is registered in files which are called CDR files. These files are closed periodically and the next file is opened to continue the data warehousing. Such operation is achieved every time and the prepared files diverted to billing center to be processed by other software which will be finally converted to subscribers' billing hard copies.

We used 5 mobile numbers and made some voice connections to get the same information from a specific CDR file in a MSC/VLR exchange office. Then we transformed the CDR file to text file and changed it to a matrix which is entered to MATLAB soft ware for making the connection graphs.
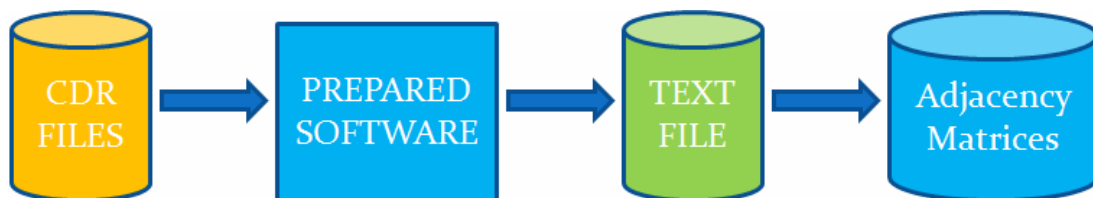
**Fig.2** diagram of generation matrices using CDR files

Our mobile numbers were retrieved from CDR file and entered to an Excel sheet for further operations.

Table 1 A sample table extracted by software from CDR files in a short time period

A-number	B-number	Start time	End time	Call duration
number1	number2	8:51:30	8:55:12	0:03:42
number2	number5	8:55:03	9:10:34	0:15:31
number3	number2	9:00:52	9:05:34	0:04:42
number4	number5	9:02:16	9:08:44	0:06:28
number5	number3	9:05:55	9:07:45	0:01:50

From such tables a lot of information can be obtained about social networking. The call duration column can be suppose as weight of graphs and every subscriber (actor) which is demonstrated by her/his MSISDN (Mobile Station Integrated Service Digital Network Number) can be assumed as nodes or vertices. The table can be converted to a matrix or sparse matrices

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and then can be consumed for establishing the social network graph. The following matrix and graph have been manipulated as an applied pattern.
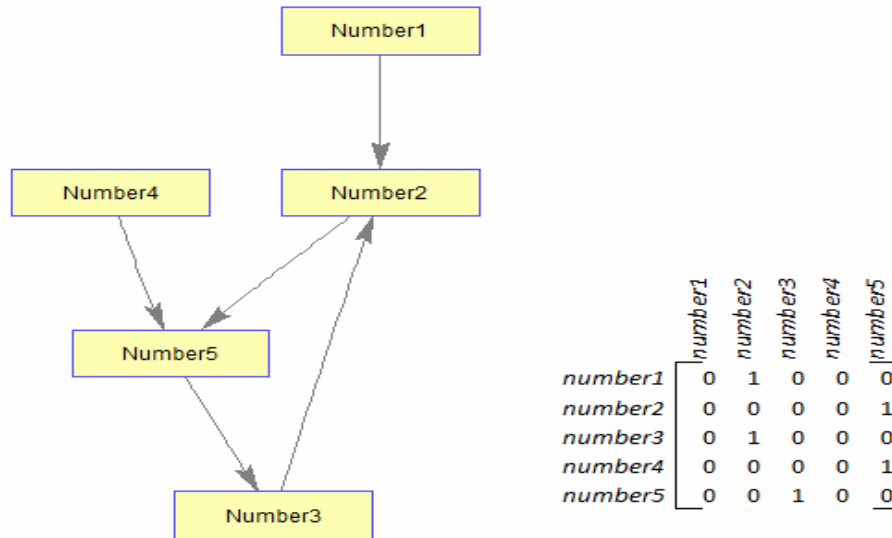
Fig.3 The result graph and its adjacency matrix

Extraction the information about behavior of individuals and communities is ongoing in recent years by using new devices which is hired to prepare life log. The alternates such as wireless LAN and mobile phone equipments have confined because of their non consistency functionality and yield us only imperfect data to exploit. Gathering such information can be achieved only by pre prepared complex software which can change the CDR files to text format that is solely used by communication corporations. In related approach 100 mobile subscribers voluntarily were traced via the designed software and installed in mobile phones [10].

The cited graph can illustrate all legal, illicit, private and other informative data. Such mass information that will be appeared in this method can be used in other fields such as classification of groups of mobile phone MSISDN ranges those dedicated to specific community. In designing graphs the SMSs also can be considered as a connecting method.

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