C. Dobbins, M. Merabti, P. Fergus, and D. Llewellyn-Jones, “Towards a Framework for Capturing and Distributing Rich Interactive Human Digital Memories,” in *The 12th Annual PostGraduate Symposium on the Convergence of Telecommunications, Networking and Broadcasting (PGNet’11)*, 2011, pp. 1–8.

Towards a Framework for Capturing and Distributing Rich Interactive Human Digital Memories

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Abstract **– The area of human digital memories has placed considerable focus on documenting the things we do, the places we visit and the thoughts we think. Rather than sharing important events face–to–face, *i.e.* by watching home videos together or looking through photo albums, people tend to share their memories with each other through emails or text messages, or by posting them online. The difficulty is that the vast amounts of data we collect are often difficult to access and less meaningful to us over time. The challenge is to structure human digital memories in a way that can be easily distributed and recollected at different time periods in our lives. More specifically, the collection and organisation of memory-related information (images, video, physiological data and so on) needs to occur using ubiquitous ad hoc services, prevalent within the environments we occupy. This is likely to happen without us necessarily being aware that memories are being created. This will remove the need to manage the growing number of information sources that require conventional tools to achieve this, for example, a camera to take stills and video. This paper posits a new and novel idea that builds on the nomadic nature of people, ubiquitous computing, context awareness, physiological computing, semantic annotation and ad hoc networking that will allow rich interactive digital memories to be created amongst individuals and their environments that are unobtrusive to individuals.**

Index Terms**—Digital Memory, P2P, Networks, Semantics, Sensors, Clustering, Ubiquitous Computing, Ad hoc Networking, Physiological Computing**

I. Introduction

Memories are an important attribute of human life and experience. The practise of storytelling is one that has been performed over hundreds of years, illustrating the importance the process of recalling these experiences plays in people’s lives. With the digital age now upon us the practice of capturing and uploading digital content for personal use and for sharing with others has become second nature in today’s society. From this inherent need to record many aspects of our lives we find that increasing numbers of people share content online using outlets such as Facebook, Twitter and Flickr. This allows us to digitise episodic memory and experiences in new and novel ways.

The challenge of storing all of one’s accumulated memories has been a topic of interest for many researchers, ever since the idea was first proposed in 1945 by Vannevar Bush. Bush foresaw this challenge and invented the ‘Memex’ a “device in which an individual stores all his books, records, and communications, and which is mechanized so that it may be consulted with exceeding speed and flexibility. It is an enlarged intimate supplement to his memory” [1]. Since the Memex, researchers have been investigating different approaches into how aspects of our lives can be captured and shared digitally. As such, with the advancement of storage capabilities, the notion of storing everything one accumulates over a lifetime does not seem impossible and is closer to becoming a reality than first expected. However, as the amount of data we collect grows it is also at risk of becoming unmanageable and meaningless. As this data amasses daily, our personal mementos will undoubtedly be lost amongst the hordes of useless information that is also generated. There is therefore a challenge to be able to add meaningful information to digital memories so that they can be structured and organised in a more systematic way, for example by time. This will in–turn lead to a better retrieval rate as the data has more information associated to it. Technological advances, such as with the improvement in data storage mechanisms and the advancement of data analysis, will allow new possibilities to arise that will allow content about us, including family and friends, to be clustered based on topic, experience, location and time. This will also include information from physiological computing, therefore providing a richer understanding about aspects of our health, activity and physical wellbeing, including how we made others feel at that time. This paper focuses on a proposed framework that will construct and store rich interactive digital memories, comprising of images, audio, video and stills, including data streams from physiological computing, which will

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significantly enhance the memories that we are proposing to store within the framework. In this sense, a memory will contain rich structures and varied information sources that emerge through the semantic clustering of content and other memories and will form part of compositions between other memories about ourselves, our friends and our family.

The structure of the paper is as follows. Section 2 provides background information on the field of digital memories. In Section 3 we provide our initial framework design before we describe a case study on how the framework may be used in Section 4. We conclude the paper in Section 5 and provide details of our future work.

II. Digital Memories

A digital memory is an extension of our human memories and can be perceived as a way to preserve our experiences over a lifetime. Since Bush’s Memex [1], researchers have been investigating different approaches into how aspects of our lives can be captured digitally. The following is an overview of the current work within this area.

A. Capturing Digital Memories

Capturing memories is a pastime many of us are familiar with. The advancement and partnership between smartphones and online sharing channels has allowed these events to be captured and shared instantly; YouTube and Facebook alone have over 200 million views a day from mobile devices [1, 2] respectively. This explosion of the capturing and sharing of content ubiquitously is one that will only strengthen over time.

However, as well as capturing thousands of images and hundreds of hours of video footage, researchers are exploring different ways that we might use technology to capture memories about our everyday lives. Physiological computing, using sensor–based systems, is rapidly emerging as a new way to capture our every move and to monitor our health and wellbeing. The development of smaller sensing devices and wireless communications is revolutionising the way in which a subject’s health can be monitored, ubiquitously [2]. Lee *et al.*’s [3] work uses the SenseCam to capture one’s daily routine through the medium of a wearable camera. Data is presented in a timeline format, similar to an approach used by MyLifeBits [4]. Wearable cameras have also been used in other projects as a form of ‘lifelogging’ or ‘body blogging’ memory retrieval tools. Projects, such as Healey and Picard’s [5] StartleCam, uses a wearable camera and sensors to “Capture events that are likely to get the user’s attention and to be remembered” [5]. Whilst Dickie *et al.*’s [6] eyeBlog captures video streams based on eye contact with the user. Gilleade and Fairclough [7] have been experimenting with body blogging in public and have implemented a prototype system that monitors a subject’s heart rate 24 hours a day and posts the results on Twitter every 30 minutes [7]. Belimpasakis *et al.* [8] have used mobile phones for the purpose of life logging and have implemented a “client-server platform that enables life logging, via mobile context collection, and processes the data so that meaningful higher-level context can be derived” [8] such as the user’s location and who they were with. Blum *et al.* [9] have developed the inSense system, in which the user’s current situation is evaluated online. In this system, the user wears acceleration and audio sensors that perform real–time context recognition so that if the system detects a moment of interest, it takes a picture and stores a short audio clip.

The ideas that have been brought forward are quite useful in recording aspects of our lives and the idea of sensors to monitor skin resistance could be utilized when taking photographs. However, there are limitations to this; for example, processing and tagging data can be very time consuming. Furthermore, the deletion of unnecessary data can also be problematic as inevitably; boring and mundane everyday tasks would be captured, which would be of no interest to us, upon reflection as all of the data would be the same. Another drawback to this work is that there is no feedback from a test group. By providing feedback from test users an idea could be formulated as to how the system would perform if it was deployed into the market. In contract we intend to evaluate our framework by first testing it ourselves and then by performing a randomly controlled trial.

B. Presenting Digital Memories

Whilst capturing memories is an easy and enjoyable activity the task of organising and presenting this information takes a bit more time and is often neglected by the user at hand. If data is not structured correctly then the risk of it becoming useless and unmanageable is greater. Whittaker *et al.*’s [10] study, on people’s ability to retrieve photos that were over a year old reinforces the idea that without proper structure, data can be inaccessible. The study concluded that, “It was difficult to obtain accurate estimates about the exact number of digital photos each person had, due to a lack of organization. Photos were often distributed across multiple storage devices and machines” [10].

The use of timelines to organise data is not a new concept and has been the subject of many projects. Microsoft’s MyLifeBits: Fulfilling the Memex Vision [4] is a 21st century interpretation of Bush’s original idea [1] and is about addressing a user’s need to store all of their personal files (audio, video and photos) easily, as well as having effortless access to them. Content is displayed based on time, since the authors argue that this is the best way to remember content: “Standard forms of context data, such as time, date, number of accesses, etc. have proved beneficial in retrieval from various collections” [11]. Plaisant *et al.* [12] have proposed a similar approach called LifeLines that uses the timeline concept to map a user’s own history onto a timeline. In a similar way, Kumar *et al.* [13] use the timeline format to visualise historical events. Using timelines in this way has become very familiar to people that use computers, *e.g.* it is used to organize files on a user’s computer. Fertig *et al.*’s [14] Lifestreams and Rekimoto’s [15] work both use timelines to

[1] http://youtube-global.blogspot.com/2011/01/music-videos-now-on-youtube-app-for.html
[2] http://www.facebook.com/press/info.php?statistics#!/press/info.php?statistics

organize, "Every document you create" [14]. Picault *et al.* [16] have presented some interesting ideas on how to structure and arrange a user's personal information so that it is easily accessible and can be more effectively retrieved. Their work focuses on the structure of data in a timeline format – "Recalling a piece of information is easier when the user can remind themselves about events in time and space" [16]. Organising data into a timeline format is the most effective way for memory retrieval however this approach is not flexible enough and can be considered one-dimensional. In order to create more productive queries data needs to be organised, not only based on time, but other factors as well, such as who else was present at the time (friends), what was being felt (emotions) and where the memory took place (location). We intend to address these issues within our framework by semantically linking many data sources together to form richer memories that can be searched through more easily. This is a key aspect that differentiates our framework from others. We intend to create a system that will bring together and encompass various data sources so that a vivid interactive snapshot of our lives can be captured, reasoned upon and searched through. Interaction with our memories is fundamental to our ideas and is what makes it unique. By enabling user's to be able to "go into" their memories and to see various data, such as temperature, location and emotions, this could lead to the augmentation of group memories and has the benefit to benefit various aspects of people's lives. Whether it enhances social groups and interactions or aids in the health and recovery of memory related illness the possibilities are endless.

C. Distributing Digital Memories

A fundamental aspect as to why people capture their memories is so that they can be shared with others. In today's society this usually takes the form of sharing content online, via social networks, or ubiquitously through the use of mobile devices.

The utilization of mobile phones to capture and share content is a growing trend. With the explosion of smart phones and online sharing applications at your fingertips, sharing one's experiences can happen in an instance. Plomp *et al.*'s [17] work focuses on experiences, *i.e.* what are they and how can they be developed and shared, and the evolution of Web 2.0 applications and the expanding role of the user within the generation of shared content. Their work also concentrates on the idea of a 'digital ecology,' "Where people and technologies are in constant change" [17]. This is an interesting approach and the idea of a 'digital ecology' is a unique way to conceptualize the growing trend of the digital era. Park and Cho [18] discuss how a mobile social network can be constructed by obtaining the life–logs of users and how this network can be used to share information. Graham *et al.* [19] focus on how mobiles affect our everyday lives and how they can be used to share our digital memories. Sarvas *et al.* [20] developed the mobile system, MobShare that "Focuses on immediate and controlled sharing of pictures within a circle of acquaintances" [20]. In a similar way, Jacucci *et al.* [21] created the mobile system mGroup, which "Supports groups in creating and sharing experiences" [21]. Their approach mainly focuses on large events whilst Cheng, Yu and Chou's [22] system incorporates RFID technology with mobile phone communications that supports, "Peer–to–peer communication, weblog, RFID, wireless networking, and mobile phone technologies to enhance social quality of shared life experience" [22]. Mobile phones have quickly become a constant fixture in most people's lives and are the easiest way to capture and share digital memories. Creating web-based applications can overcome this fragmentation issue however if the Internet is not available then these applications would be rendered useless. Shifting reliance away from the internet would create more robust applications, which could be used in any type of situation. Another drawback is the annotation, searching and sharing of memories on mobile devices. This is not necessarily as easy as with a desktop computer. Sarvas *et al.* [20] state that "Browsing, combining, and discussing the pictures is more convenient using a desktop computer with a large screen, a mouse, and a keyboard rather than using a mobile phone with a small screen and a limited input keypad". However, in terms of capturing data, the mobile phone fits well with our natural ability to move within our environment. Memories are not isolated static events, but rather a continuous sequence of experiences contextually linked and created within and across different geographical areas within the environments, we occupy. This will be a key requirement in our future work, yet it is important that the mobile phone does not become the centre point but rather a stepping-stone to new and novel ideas.

Social networks also play a vital role in distributing digital content to a wider audience and are the preferred way to share information, as can be seen through the astounding number of users that are connected to these sites. Chard *et al.* [23] propose to combine cloud computing with social networking in order to form a 'Social Cloud' where users can communicate and distribute their resources. Whilst, Buchegger and Datta [24] focus on ways to integrate peer–to–peer (P2P) networks within social networking. They present an interesting insight into the ways in which P2P networks can be used in social networking environments and also how the issue of privacy could be handled within such a network. Kalofonos *et al.* [25] discuss the use of peer–to–peer networks in social networks. Their MyNet implementation is a "Platform for secure P2P personal and social networking services" [25] that enables the secure discovery of a user's resources. It also allows each user to create a "Personal Device Cluster" [25], composed of their devices, in order to create a social P2P network amongst their friends. In a similar way, Geambasu *et al.* [26] implemented HomeViews, a peer–to–peer middleware system that "Facilitates ad hoc, peer-to-peer sharing of data between unmanaged home computers" [26]. Ismail *et al.* [27] have also designed a framework to identify personal memories through photo image analysis and a report system. Their system uses the JXTA P2P networking architecture to create a virtual network so that peers can share their serendipitous moments amongst themselves [28].

By combining P2P networks and the concept of social networking users can create their own ad hoc networks and connect different devices to share their memories in a decentralized manner, by taking "advantage of real social networks and geographic proximity. In contrast to centralised web servers, local connectivity can facilitate social networking without Internet access" [24]. However security is an issue since there is no centralised system to regulate the administration of content. Rahman *et al.* [29] also feel social P2P networks would be a good way to share memories and have identified several challenges which need to be addressed in order for this to be realised. Challenges such as restricting data access to appropriate users, establishing a network that represents real world social relationships for each user and providing searchable data that uses a broad range of parameters [29], have been identified, to name but a few. This method of sharing data appears to be the simplest and most convenient way to connect devices and to share content and is one that will be considered and explored further within our future work, paying particular attention to Ismail *et al.*'s [27,28,30] work, given that this relates closely to our own.

D. Describing Digital Memories

Recollecting past events and reminiscing over past artefacts, whether old photographs, videos or documents, is made easier if the objects are annotated. In order to hold any appreciation of your media, it is clear that annotations and stories are essential [4].

The Semantic Web, as Uren *et al.* state [31], "Envisages technologies, which can be used to generate "intelligent" documents imagined 10 years ago" resulting in "Web pages with machine interpretable mark-up that provide the source material with which agents and Semantic Web services operate". Semantic blogging "Provides improved capabilities with respect to search, connectivity and browsing" [32] and can be used to create a social web. The Resource Description Framework (RDF) model, "An infrastructure that enables the encoding, exchange and reuse of structured metadata" [33], can also be used in conjunction with the semantic web to represent a user's digital memory since "It is flexible enough to represent the metadata extracted from the user's digital artefacts. This would allow digital memories to expand and grow [34]. Semantic annotation and ontologies provide a way to bring together the structured commands that a computer understands with the uncertainty of our natural language for effective searching. Baowen *et al.* [35] comment, "In semantic annotation, the ontologies are used to describe the meanings of objects, relationships, and hierarchy structure of given resources". The Bridge ontology, as proposed by Baowen *et al.* [35], "Expresses the relationships between multi-ontologies". This has the characteristics of being low-cost, robust and scalable and avoids the unnecessarily extending of the ontology. This also allows the ontology to be reused and more easily created and maintained [35]. The COHSE (Conceptual Open Hypermedia Services Environment) project provides the architecture to link independent Web pages and services to provide information about relationships in subclasses and super classes [36]. While Naing, Lim and Hoe–Lian [37] have proposed a way to improve the Ontology–based Web Annotation (OWA) framework, by concentrating "on the ontological annotation of hyperlink structures, and propose some extensions to the existing annotation language to represent such annotations" [37]. The KIM platform provides semantic annotation, indexing, and retrieval services and infrastructure, by performing information extraction based on an ontology and a massive knowledge base [38]. While Petridis *et al.* [39] propose "an integrated infrastructure for semantic annotation of multimedia content".

Using the concepts behind the semantic Web this technology could be used as a powerful way to create and distribute digital memories. If machines could understand the meaning of our photos or videos then the task of searching, tagging and distributing them would be easier and all of our online personas could be brought together and linked. However, there are a number of shortcomings, such as the use of natural language, which is ambiguous and can be inconsistent. There is a challenge to be able to create a formal representation which can be used by most users. The idea of the semantic Web, semantic annotation and the use of ontologies is one which is appealing to build upon because if an understanding, by the machine, could be made of the data that we are processing then more dynamic and richer data could be created. Clustering data is an important aspect of digital memories because users inadvertently cluster their own photo collections based on time and events, therefore when storing and searching for images on a computer this idea is fundamental. PhotoTOC, proposed by Platt *et al.* [40], is "a browser for personal digital photographs that uses a clustering algorithm to automatically generate a table of contents of a user's personal photograph collection" [40]. While Harada *et al.* [41] developed a timeline browser for PDAs that uses a time–based clustering algorithm to organise related photos together [41]. Harada *et al.*'s [41] algorithm has been based on previous work by Graham *et al.* [42] in which their original system uses the recursive way in which photographs are taken, in bursts and represented using a tree of clusters where photos are stored only at the leaf nodes [42]. Kikhia *et al.*'s [43] work however focuses on building a life logging system, which clusters data into activities, to aid in memory support. The concepts that have been brought forward are quite interesting in terms of organizing such vast collections of photos; however digital memories are comprised of so much more data than simply photos. The clustering algorithms used would have to be extended beyond this scope and comprise of other forms of data as well, such as audio, video and physiological data so that our memories can be enhanced and these clusters can form a richer snapshot of our lives.

III. THE MEMOSCYNE FRAMEWORK

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Throughout the current research we have found that there are limitations in relation to the semantic annotation of digital memories and in the search and retrieval of these items. Currently, searching is one-dimensional and, as Gemmell *et al.* [4] have commented, is impossible if manual annotation on the content has not been performed. Data is generated at a tremendous rate, however there is very little meaning behind this data and the way in which it is structured and accessed is disorganised.

While many research projects have been conducted in this area, several outstanding challenges still remain. The management of data and its transformation into meaningful information that can be reasoned upon and automatically annotated and tagged still presents a significant challenge. Addressing these challenges is important if content–based searches are to be performed and processes are to be developed to store and share memories in a more flexible way.

In order to overcome these challenges we propose an initial framework design and a simple case study that helps understand the requirements for a platform to support rich interactive digital memories. This framework will enable memories to be searched through and shared between individuals in order to build a shared memory and to distribute individual memories.

The main objective for the idea posited in this paper is to propose a framework, as illustrated in figure 1, to model the way in which our memories can be stored, analysed, searched through and distributed.

Our initial design will be composed of the following elements:

- Network Layer – The network layer is used to connect all of our various devices together, *e.g.* handheld devices, sensors and services. For this layer we envision using personal area wireless networking protocols so that devices within close proximity can be connected together.
- Memory Structure – In this instance a memory will be composed of a variety of inputs such as Physiological and Environmental data, including Personal Media (*e.g.* photos, video). All of these components will need to be brought together and organised and clustered, based on time/event, and then be made discoverable to the application. The application would then manage these memories (sort/update) and enable new memories to be stored, current memories to be updated, edited and shared with new information that can be taken from other user's memories/inputs. The initial reasoning for these memories will be based on proximity, since user's that are closer to you would be more interested in your developing memories, as opposed to users that are further away, *e.g.* in another building.
- The initial design will use a service to gather various sensor data that will be able to track the user's movements and bring together any other data, which has been accumulated at that time, so that a memory can be formed. Once more development work has been undertaken the use of clustering algorithms and physiological computing algorithms will also be introduced so that the memories can be "tied" together and searched upon.
- The memory file itself will need to be stored within a data store where all of the inputs could be stored, and arranged based on date and location. The framework can be extended using plugins and this allows processors to be used to format memory structures in different ways, for example, as CSV, XML or using a semantic serialisation language, such as RDFS or OWL. This information would then need to be translated into a GUI that would display snapshots of all of the available data and that could be opened in order to view more details about the memory. It is here that another user in the vicinity's memory could be 'seen' and 'activated' and where the exchange of memory data would occur.

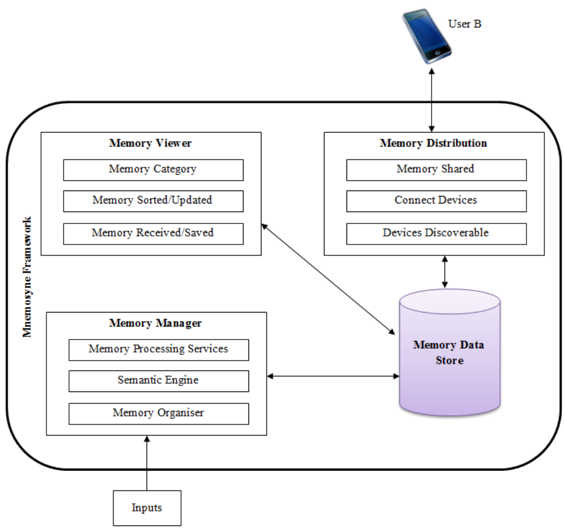

Fig. 1. Proposed Memoscyne Framework

The Memoscyne Framework will be composed of four main elements, as illustrated in Figure 1. These are the Memory Manager, Memory Data Store, Memory Viewer and the Memory Distribution, which will work together to form our rich interactive digital memories. Described below is an overview of what each of the components will do.

- **Memory Manager** – The memory manager is where the memories will be built and enhanced. Inputs are received initially from a variety of sources (*e.g.* Physiological and Environmental data, Photos, and Videos *etc.*) and cut up and organised to form a

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memory. The memories will then be clustered based on time/event and then will be stored within the memory data store. This area will also handle the semantic engine for creating, composing and linking data sources with the memories. The memory processing services will also be present here, used for reasoning upon the memories so that searching, clustering and retrieval can occur. Memories will be put into categories to determine who can participate in the viewing and sharing of them. For example, public events anyone can contribute to and private events that only family and friends can see and modify and extend. This is where they will be reasoned upon as to who can see/participate in the memory. Once the memories are put into categories then they are transferred to the data store. All of the aspects involved in creating memories are handled here.

- **Memory Data Store** – The memory data store will contain memories that can be extracted and viewed or updated. Here there will be different areas that make up the store. There will be a private area to store discovered memories, which can be reviewed by the user, as well as a public area that will be composed of multiple levels, *e.g.* family, friends and acquaintances, that necessarily wouldn't be interested in each other's memories. This is an important aspect of the system that will act as the central unit from which all memories are stored and accessed. Without this component there would be no storage area for our memories.

- **Memory Viewer** – Information from the data store will be sent to the viewer where memories can be viewed and sorted. Memories can also be updated here and written to the data store. This aspect of the system is also important because this will be the interface to the system.

- **Memory Distribution** – This is where memories will be distributed to other users. Devices will be discovered automatically and connected to in order to allow memories to be shared. When another user participates in our memory the new memory will be saved to the Memory Data Store to be transferred to the Memory Manager where the memory processing services and semantic engine will then link it to other memories. Distribution of our memories will be based on proximity and device connectivity policies, *e.g.* public and private events will need to be recognised. The distribution of user memories will be used to enhance our own memories and vice versa.

Linking all of these components together will form the Memoscyne Framework. The Memory Data Store will provide the central unit for saving the memories. From here they can be updated, viewed or distributed. We envision that this system will provide users with an outlet to capture, share and interact with their memories in a real-time environment.

IV. Case Study

The system could be employed to encapsulate a user's movements throughout the day and capture and collate any photos, physiological and environmental data that are obtained. These could then be shared amongst other users in the network that are in the same vicinity, building up a complete picture of the user's day and interactions. For example, in the scenario of attending a concert, only the users within the arena would be of interest to help enhance our memories. These users would connect their devices together automatically, after sensing that they are all in the same place, to form an ad hoc P2P network. Once photos and videos start to be taken, they can be shared within the network. For example, *A* who is at the front and closer to the stage would have better footage than *B*, who is at the back of the arena. Therefore, *B* would be interested in *A*'s memories and therefore would want to enhance their own captured memories with the footage from *A* in order to build up a shared memory. Consequently with future development this idea could be progressed into augmenting memories into full 3D 'fly–throughs' of events.

Proximity is fundamental because someone outside of the arena, perhaps in the same city, would not be interested in contributing to these memories, as illustrated in figure 2. Also, using the concert event as an example, this would be a public event and therefore automatic information tagging would be easier to produce. The application would know the user's location (*i.e.* the arena) and obtain the information from the internet of events that are happening at the arena at the same time and tag this event information with our developing memory. More research needs to be done to establish how private events could be tagged just as easily. Interacting with these memories would also be a fundamental part of the system and would occur when devices connect with each other and interact to share information to enhance and participate in each other's memories.

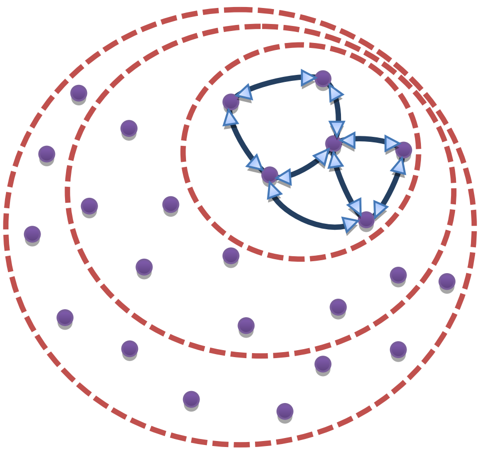

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Fig. 2. Users within the same proximity would be more interested in creating shared memories as opposed to users outside their scope.

With the case study in mind we are currently developing a prototype based on Android technology, in which a service is being developed to track a user’s location throughout the day and collate all inputs with this location data. Currently the service records the date, time and location of the user and updates periodically, and then displays the current location within the application interface, as shown in Figure 3. This information is then stored in a database and serves as a record of the user’s movements throughout the day. This information is used to build a reliable dataset. With further development work all data, *e.g.* pictures, calls and videos can then be tied into the visited locations to create an accurate timeline or the user’s day.

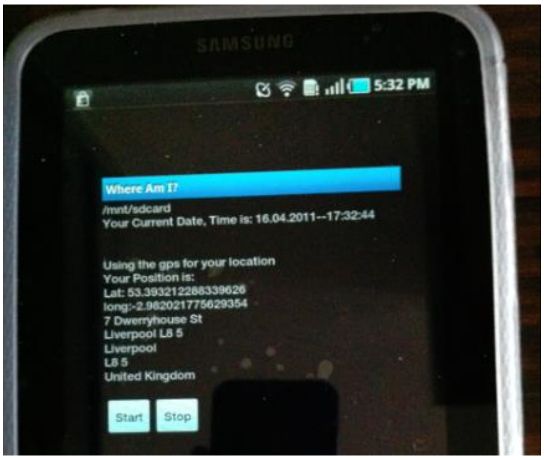

Fig. 3. Where Am I? Application running and tracking the GPS location of the user

This provides the initial foundation services for the framework posited in this paper where location acts as one source of information. When the application is initially started data sources are dynamically searched for and incorporated as potential constructs for our memories (this is dependent on the hardware and services available at the time to the application). Consequently, the framework is equipped with the ability to link to the camera hardware on the Samsung Galaxy device used in our implementation, and to use this data to comprise our dynamically evolving memory structure.

This is a work in progress with current developments looking to extend the required framework services needed and to include support for plugin tools that will include RDF and the RDF query language SPARQL, for semantic annotation. The use of mobile technology and Android technology will also be considered as a means of creating ad hoc P2P networks so that data can be captured and distributed ubiquitously. SQLite is also currently being used to store our memories and will be extended to support additional features, as this is compatible with the Android technology. Future development work aims to implement a P2P network in which devices can connect and utilize their resources in order to capture, store and distribute memories in a real–time environment.

V. CONCLUSION

This paper has posited an initial framework design for capturing and distributing rich interactive human digital memories. It is a work in progress that has focused on the ability to incorporate the information sources required for constructing memories. In this paper this has been limited to location; however the mechanisms can easily be reused to include other sources, such as the camera and microphone. The work has been tested against a simple case study that considers a public event and how data can be shared to form a collective memory. Whilst simplistic in nature it has provided the basis for determine what core services are required. It has also been demonstrated that our initial idea has the potential to be developed extensively. Not only will memories be able to be reasoned upon but potentially they could be transformed into 3D visualization of events.

We have identified several issues relating to the search and retrieval of digital memories, including the need for semantic annotation services. We have also presented our initial framework design concepts, along with a viable case study and details of our on–going implementation. Capturing, distributing and interacting with memories will need to be more flexible, with the use of decentralized P2P networks and automatic semantic annotation. Our devices should be able to communicate and recognize each other whilst capturing information from our surroundings. Our memories would be used to form a rich snapshot of our wellbeing, at a particular time, and would greatly aid the process of reflecting upon those times.

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