Learning and Teaching with Geomedia

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Edited by

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PREFACE

Our lives are thoroughly ‘geomedialized’. Geomedia technologies that emerged and – particularly important – were popularized in the course of the last decade shape the opportunities we have to appropriate the world around us and to act within society. Global positioning systems, ubiquitous computing, web mapping in connection with remote sensing and the convergence of media contribute to a geoweb providing an increasingly powerful aspect of our everyday action in space. The use of these technologies is a very specific aspect of an emerging digital culture that our schools have to prepare for.

We receive news such as twitter messages, ‘just in time, geo-localized’ on digital globes. Web information is available everywhere, as is the cloud. Our lives can be recorded within social networks, visualized in a framework of time and space. We are guided in both the countryside and cities by GIS navigation systems. Our view of the city is extended by applications combining geo-localization, image recognition and web content, adding meaning to the things we see. The smartphone alerts us when we are near to certain sites, and spatial referencing offers the possibility of combining personal interests with spatial information. Apps synchronize geo-location with our personal timetable on a tablet providing the latest traffic and transport information for our current position. We know where our social network friends are and can arrange spontaneous (face-to-face) meetings. We produce spatial data by evaluating a restaurant we have visited, or simply, even without realizing it, by having been in an area while looking up a certain word in a search engine. Each photo taken with data glasses is uploaded while being enriched with various metadata. Finally, we can produce and design our own maps with user-friendly web mapping tools. In the end, we may encounter mixed realities enriched by digital and geolocalized data and a merging of real and virtual spaces.

In sum, we constantly consume and produce media which carries geo-referenced information. In the context of this book, we refer to these kinds of media as ‘geomedia’. Geomedia are not only cartographic media but also geo-tagged pictures and written descriptions of paths and places. Today, geomedia come with an enormous semantic field closely linked to web2.0, the Internet of social interaction. To be more concise, geomedia connects the web2.0 with the lifeworld by providing a reference to

physical human beings. The ‘virtual world’ of the web seems to belong to yesterday; the web of today clearly enriches our everyday lives. A renaissance of space and place foils the idea of overcoming space in a digital age. At the same time, geomedia and the resulting data sets are media of surveillance and control, of intrusion into intimacy and the use of very private spatial data for commercial aims, and these clearly change our concepts of privacy and culture as a whole. To conclude, geomedia are ever-present in everyday life; they shape action and encourage thinking and reasoning – and their use needs reflection and reflexivity.

Education has to enable students and teachers to come to terms with this development. This carries two main aims: learning to act with geomedia in everyday contexts, and utilizing geomedia to understand spatial problems in the domain of science. In other words, the geomedia society requires abilities and capabilities to utilize geomedia, as they are a central medium for learning, thinking and communicating about spaces, as well as for achieving and retaining power and influence over places. Participation in society therefore increasingly needs geomedia literacy. The task for geomedia education is, in a minor way, to teach technical skills; in a major way, it is to enable the mature and self-directed utilization of geomedia.

The aim of this book, therefore, is to support teachers and teacher trainers, through an overview of current technical, social and pedagogical approaches and through ready-to-use learning environments. The collection of learning environments utilizes geomedia to support learning and problem solving in the spatial domain. The book offers new ideas for implementing teaching strategies with geomedia that foster students’ creativity and participatory abilities. It contributes to the education and empowerment of spatial citizens who are able to act in a complex, geomedialized world, while being adapted to it, but also constructing, shaping and reinventing it.

This book is an outcome of the digital-earth.eu project, an EU Comenius Multilateral Network that aims at the promotion of geomedia usage and teaching in schools. It is congruent with the network’s purposes to share innovative best-practice examples to inspire and encourage transfer beyond national borders. This book unites contributions from researchers and practitioners from all over Europe. All learning environments are field-tested and transferable and provide the basic considerations and materials to be adapted by the reader.

The structure of this book is given by placing the learning environments (Part II) in a kind of continuum. It starts with simple technical aspects of mapping, and introduces the challenges of spatial thinking. These learning

environments support consumption as well as map production abilities and capabilities, encompassing single-step analytical tasks leading to hypothesis construction, as well as exercises to collect, select and modify spatial data, to comment on visualizations and to design one's own. Further papers in this book address the necessity for the reflective and reflexive utilization of geomedia. Reflection refers to the deconstruction of societal discourses hidden in geomedia, a change of perspective that allows the evaluation of a geomedium's ability to handle a certain task or problem. Reflexivity relates to the capacity to produce conscious hypotheses by being aware of one's own construction of spatial scenarios based on medium, preconditions, and one's own interests, which prepares for conscious, mature and responsible communication with geomedia.

The book concludes with learning environments aiming at participation in society through geomedia. These environments refer to the expression of interests and broad communication and negotiation using geomedia in a web2.0 context and address citizenship competences, as described in Spatial Citizenship.

This order is not necessarily an order of complexity: each learning environment may be used in, or transferred to, different levels of achievement.

The book is framed by three introductory chapters to contextualize the learning environments (Part I). The first envisions the rapid technological development of geomedia; the second discusses the influence of geomedia on society, societal power-relations and the consequences for everyday action and decision making; the third discusses and illustrates the pedagogical background of learning with and about geomedia.

The editors hope that the book will help teachers to use the learning environments, adapt them to their classroom situations, and enhance them or build similar learning environments for their own teaching. The book should inspire teachers to experiment and creatively develop similar or altogether different learning environments, helping students to navigate more competently the emerging geoinformation society. The technology is there and easy to use, so teachers and teacher trainers are encouraged to contribute to geomedia education through their own approaches.

The editors strongly believe that this endeavour is not simply about adaptation to a new technology and its associated culture. We suggest that geomedia are helpful for our students to re-invent their world and society; they are not just a means of handling the given world. Geomedia in this case become a medium of empowerment for young people to actively design their worlds.

The editors are indebted first to the authors who have borne with them through delays in the process. All of the papers underwent several rounds of review, and even so, we could not publish all papers on offer. Beyond the editorial team, Nicole Ferber (Salzburg) has been incredibly helpful with all institutional issues at the coordinating institution of the digital-earth.eu network, as well as with the final version of the book. John Lyon did proofreading despite being always busy at the Geographical Association, Sheffield, UK. Mary Rigby (Glasgow) was amazingly helpful doing copy-editing. Viola Geiger (Salzburg) expertly did the final formatting with help from various staff at Cambridge Scholars Publishing.

During work on this book, four digital earth natives were born to members of the editorial team in late 2012 and early 2013, enlivening editorial meetings, and both hampering and inspiring our work: Camille, Anouk, Eleanor and Hannah.

We would like to dedicate the book to them.

PART ONE:

GISOCIETY AND GEOMEDIA EDUCATION

CHAPTER ONE

TECHNOLOGICAL FOUNDATIONS FOR THE GISOCIETY

JOSEF STROBL

Abstract

Based on the observation that today's 'information society' is based increasingly on leveraging the added value of 'location', this chapter briefly explores some of the main technological foundations for this trend. It is demonstrated that a set of geospatial techniques, as well as general ICT trends highly relevant for location-based applications, are facilitating and sometimes driving the emergence of a highly spatially aware digital practice of personal, communal and societal interaction. These developments generate questions regarding required literacies, which should be considered essential components in teaching and learning processes.

1 Introduction

Society today is frequently labelled an 'information society' in an age of pervasive digital technologies. Megatrends are driving current developments. One of these is ubiquitous and permanent connectivity. Being 'always on (line)' was expected to make people less dependent on the operational contexts of a location, as was speculated in the 'Death of Distance' debate (*Economist*, 1995; Cairncross, 1997). Just as the Internet originally had a military background, the use of satellite signals for positioning triggered another megatrend – one of pervasive positioning.

As this technology moved into consumer electronics, it triggered the 'Revenge of Geography' discourse (*Economist*, 2003). Obviously, the information society did not turn its citizens into location agnostics, but rather led to the contrary, the dominance of 'where'. Perhaps triggered by the uncoupling of communication from co-presence, bringing location into

the personal digital realm was urgently needed to balance the effects of telecommunication.

Thus the 'spatial turn' into a Geo-Information Society is obvious throughout its digital infrastructure, as well as in its daily workings. Very few tasks, interests and activities of a person are independent of location. Location is not only a measurable position; it defines what is around it by proximity and distance. Location very effectively serves as an integrator across all domains – database experts would consider position as a key facilitating 'spatial join' operation. This spatial integration across 'layers of information' or domains of interest effectively turns locations into places (Goodchild, 2011).

With the society's realm defined by spaces, and people invariably associated with places, the concept of a Geo-Information Society gains solid traction. To be a citizen in this society, a common set of knowledge, skills and qualifications is needed. Literacy and numeracy historically have been requirements for participation in a community. Digital literacy is generally accepted as the passport into the information society, and from a GISociety perspective a certain set of geospatial literacy elements will be required.

This can be loosely connected with the traditional map-reading skills which are required as a foundation to build spatial orientation and to complete certain spatial tasks such as navigation. From a somewhat broader perspective, an individual's general spatial awareness is the foundation for spatial thinking, which supports citizens in their participation in society.

Which competences and skills are required and which will (partially) replace traditional map reading and interpretation? While this question will be dealt with in subsequent chapters, it is clear that we are aiming for a convergence of education demand and technology supply: new technologies will emerge and offer opportunities, while only those which address a (maybe new) demand will be sustained in the longer term. Technology of course is not an end in itself, but it has in the past changed societies, and it will do so in the future.

From this perspective, several key geospatial technologies are explored regarding their impact on individual action and communication patterns, and thus on participation in societal behaviour. This can only be a snapshot of current developments, and an individual assessment of relevance. Nonetheless, any such *tour d'horizon* of geospatial technologies will demonstrate the dynamics of this field and the importance of considering its links with education.

2 Key Technologies

Innovation, be this in knowledge or in technologies, has always been a driving force in expanding the horizons of humankind – literally and metaphorically. Navigating and exploring the surface of our globe depended, and still depends, on the navigation technologies available to travellers. Enjoying and leveraging the benefits of a bird's-eye perspective require flight, which opened up the huge potentials of remote sensing. Societies worldwide today share far more similar traits than did the societies of our ancestors, based on communication technology and media reaching across the globe.

Today we use the term 'Geo-Information Society' partly to express the understanding that 'GIS' is not primarily a set of technologies, but more importantly creates societal dynamics around the concepts of place and space. Still, to understand and to explore a GI Society we need to look at (some of) the current technical developments facilitating and sometimes driving progress towards a spatially 'smart' society. What are the 'top 7' geospatial technologies most relevant for the general public and thus society at large?

Universal positioning. Knowing where we are at any given moment defines the starting point for navigation, defines distance and proximity, establishes a personal 'environment', and offers choices of what to do, who to meet and where to move. Easy access to Global Navigation Satellite Systems (GNSS) signals like GPS plays a central role, particularly as most of our personal devices such as smartphones and tablets work as receivers. The resulting 'pervasive positioning' of people, vehicles and other assets is at the core of permanent spatial awareness, using the idea of *where* to learn about *what* and *who*. It therefore comes as no surprise that technologists work hard to overcome the limitations of GNSS inside buildings, in urban canyons and underground. A range of solutions have been proposed, and some are being implemented, to keep track of location outside of the range of satellite signals: WiFi positioning and dead reckoning via acceleration are just two of the approaches currently addressing the need for pervasive positioning.

Personal sensors. Beyond positioning, the latest personal devices contain a growing number of sensors. The accelerometer in each smartphone is complemented by a digital compass and general attitude sensor, and other sensors that take readings for sound and light. Our personal devices are

increasingly powerful because they serve as sensor integration platforms with a strong communication back end. This in turn facilitates a context-enriched filtering of information: when driving fast, less local detail is shown on a map. When it is dark, different navigational cues are offered.

Location-enabled apps. When looking for a place to stay, a hotel booking app explores 'nearby' first. Other searches default to a 'minimum distance' criterion. The first law (or, rather, rule) of GISocietal applications is to 'act locally'; starting from the assumption that individual context defines the area of (potential) action (AoA). We will be assisted by many more, and sometimes perhaps rather obtrusive apps, using location to connect information from different sources – for better or worse.

Augmented reality (AR). At a 'local scale', within range of our visual information, data about what we can see is being directly fused into our visual channel of perception. This idea has been pioneered by heads-up displays on the flight decks of aeroplanes, and is now being taken to mass markets through Google's glasses. Every smartphone or tablet can serve as an AR device by switching on the camera, and annotating what we see. This might be helpful for tourists, but might perhaps be even more so for locals, replacing the rather cumbersome map interface in personal navigation.

Perspective view. Traditional maps, as 'flattened views', require significant abstraction of spatial orientation and message. Interestingly, we are now moving (back?) from the 'neutral', 'objective' presentation of spatial data in the same fashion for everyone – as on a standardized map – towards a subjective, individualized perspective, where everyone controls their own view. Mapping and cartography are evolving from a product-centric view into a communication science emphasizing individualized user interfaces. The observation point in a perspective view can be a person's current location (in this case, see AR), or is actively controlled to explore an area of interest from different angles. The reasons for the attractiveness of Google Earth's and similar interfaces are twofold: less abstraction, and more control for the viewer. Perspectives are closer to the everyday experience, make information more accessible. Thus maps are increasingly replaced with perspective views, even though some areas are obscured, scale changes with depth, and everyone's perspective is different: this all makes for a more personalized experience.

Click to touch to kinetics. Interaction paradigms change, largely because of technological developments. Not to start at the digital dinosaur age of typing-based interaction, the mouse as a point-and-click device used to be the defining means of human–computer interaction. As computers shrink into mobile personal devices which are available in any kind of context, there is no space, and no use for an indirect interaction tool like a mouse. We point and touch with our fingers, giving new meaning to the term 'digital' technology. Today's generation growing up as digital natives will use a mouse-like pointer when 'working' on a desktop, but not for the pervasive interaction in all kinds of mundane tasks. 'The reach of touch', though, is limited – by the size of a screen and the need to be in physical contact. Kinetic interaction through physical gestures is now transitioning from games to more general contexts, generating interesting research questions as to which gestures will emerge as standardized spatial actions, e.g. corresponding to the now familiar pincer movement to change scale on a touch pad. Where do we go from kinetics? Well, research demonstrates the feasibility of mental control. But most of our thoughts are in specific languages. Thus it might be easier to stick with touch and motion for now.

Personal and inter-personal devices. Similar to the emergence of the personal computer some thirty years ago, another big step has led to a personal device in everyone's pocket. Computer classrooms are already on their way into the dustbin of history, as there is no need for pupils to go to a computer any more since devices are always with them. Meetings and presentations are labelled 'BYOD' ('bring your own device'), to facilitate digital interaction and tools. Watching many individuals today demonstrates that personal devices are considered an integral extension of one's self and that the majority of interactions, and perhaps of learning, occur through digital interfaces (Strobl, 2007), even when there would be alternative 'face-to-face' means of communicating. This development has come about thanks to personal devices serving as very effective, multi-functional communication assistants (remember, some early smartphones were branded as 'communicators'). Frequently, the main purpose is communication; instead of, originally, being only marginally connected with computers. Much of what serves the purpose of connecting people and interests via telecommunication, the lightweight personal character of devices, plus direct-touch interaction obviously facilitate collaborative action. Interacting jointly in front of one display is certainly done more now than when the holder of the mouse was in exclusive control.

Many more technical developments could be listed here as driving forces for change, for change in individuals' actions, change in how communities and societies work, and of course change in the skills and qualifications to be considered in education. One example of a rather invisible development at the back-end of digital interfaces discussed above is the emergence of cloud computing. Having originally started with email and now expanding into virtually all areas of computing, only a web browser or a dedicated app is needed to do the job. All storage and functionality, plus the authentication required for access, are available online 'on the Internet'. Users tare not tied to just one or a few computers where 'their' data and software are installed; essentially any kind of Internet connection is sufficient.

This paradigm change in computing has far-reaching consequences, and perhaps the biggest game-changer of all is the perspective of 'everybody' using an impressive array of digital technologies. Much lower levels of computing skills are needed, and end users can focus more on what to do and less on how to do things. The need to manage one's own computer has been removed, personal devices serving as access points to cloud services which update themselves and are easily interchangeable.

3 Technology Education?

Exploring these and other current and emerging technologies relevant from a geospatial viewpoint gives rise to questions of educational objectives. While technology education is a value in and of itself (as outlined in NRC, 2006), it is not the focus of discussion here. Citizens in a GISociety require competences based on technologies, but relating to their personal lives and participation in society.

Maps, images and other sensor readings are frequently viewed as digital representations, depicting models of the real world. This virtual world helps with monitoring, understanding and managing the real world. While this concept of a duality of the real world and its virtual representation (Strobl, 2009) is helpful in typical GIS applications, it falls short when exploring the role of geospatial technology brought into individuals' lives through personal devices.

We increasingly observe a fusion of real and virtual worlds in people's lives. Digital communication and action create realities, and a virtual representation might be more relevant than its physical counterpart. The separation of the real world and its virtual model is giving way to an integrated entity, which is perhaps best conceptualized as a 'Digital Earth'

framework where digital interfaces define and facilitate the interaction patterns among people (Fischer, 2008), between people and their environments, and are constituent for a GISociety.

Such a 'Digital Earth' (Craglia et al., 2008) clearly generates new demands on competences and skills. Many of these are explored in this book. Beyond that, education needs to explore the additional risks and dangers associated with emerging technologies. Location is an extremely powerful factor in privacy considerations, precisely because it allows the joining of small bits of information. Therefore a critical assessment of possible violations needs to be an integral part of learning. While opting in via a disclose-my-location-for-my-current-task button would be desirable, frequently not even an opt-out option is granted. We have seen anecdotal evidence of the potential of face recognition for tracking individuals, even without using a personal device: awareness of the risks associated with a highly connected digital society is a primary aim of all education.

Participation is a broadly used buzzword in many domains. The step from the Internet as just another media pathway towards 'web2.0' where the separation of sender and recipient, of author and reader, is giving way to a prosumer who can swap the roles of creator and user of information anytime is also taking place in the geospatial context (Scharl & Tochtermann, 2007). Increasingly a passive, 'consumerist', role is being replaced by a more active participation in a multi-way communication culture of 'likes', ratings and comments. Participating in a GISociety starts with these established actions, but expands towards contributions to OpenStreetMap (Ramm & Topf, 2009) as the 'Geographers' Wikipedia', the uploading of a hiking track to a community website, and the volunteering of skills and expertise for a regional portal. However, contributions of geospatial information are currently both heavily gendered (i.e., almost exclusively male) and limited to educated strata of society (Steinmann, Häusler, Klettner et al., 2013), providing ample scope for specific education strategies.

Of course the GISociety is only one of many overlapping perspectives on a rapidly evolving digital age. Yet, as people are always present in a place, interact within the spaces of their environment, take interest in regions and destinations and think about the world's dynamics, geographic information plays an indispensable role in life. Perceptions of, and thus actions in, the 'Digital Earth' are greatly influenced by the geospatial technologies available. Teaching and learning with these is, and will be, a stimulating challenge.

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CHAPTER TWO

EVERYDAY GEOMEDIA USE AND THE APPROPRIATION OF SPACE

FLORIAN FISCHER

Abstract

The geoweb (i.e. the convergence of geospatial technology, mobile web technologies and social media) has recently enabled an environment for mass participation in the production and distribution of geographic information. A vivid mash-up culture, resulting in the emergence of a variety of geomedia, is promoting space to a new paradigm for online search, communication and interaction. Geomedia provide a way to gather data concerning physical location in today's networked and multiplexed spatialities. While everyday life is shaped by physical nomadism, flexibilization, fragmentation and global flows of goods and services, geomedia facilitate new relationships between people and places far beyond a filtering by physical proximity alone. Geomedia serve users wishing to master urban heterogeneity and are used to facilitate new forms of empowerment in the appropriation of public space. Contributing users become new gatekeepers who mediate between local businesses and customers. New modes of the production of spatial meaning emerge, including interest groups with the capability of contributing to the process. Hence users of these services can be considered as agents of change in networked urbanity. We have only just begun to understand how digital citizens re-form public space in the context of its transformation by the geoweb. Based on a case study, this chapter reveals the transformative capacity of the geoweb for the 'making' of public space. It depicts the filtering, sorting and commodification of public space, and the role of different modes of collaborative mapping.

1 The Geoweb

The geoweb environment is normally associated with digital maps, routing services and locating services, but it also describes a broader phenomenon concerning the convergence of mobile communication, Internet technology and geospatial technology.

The geoweb links potentially global web-based activities to territorial snippets on the earth's surface and enables people to act upon, or with reference to, a location (be it their own, or that of an object or person). This ability is facilitated by a user-friendly environment for the geospatial organization and use of information, services and applications on the Internet.

The geoweb facilitates the democratization and increasing ubiquity of the production and distribution of geographic information on the Internet. It has disrupted a GIS-industry with its institutionalized practices for the capture, processing and provision of geospatial services for specific scientific, political and economic target groups. Two major shifts can be identified. First, a ubiquitous and user-friendly provision of geospatial services has extended the potential market for geographic information beyond GIS-experts towards a mass market of Internet users, and opened up an unforeseeable range of novel practices in everyday life. Second, the social software approach has democratized the production of geographic information, making every user into a potential contributor, allowing everyone to share, communicate through, collaborate in and produce geographic information.

2 The Democratization of Geographic Information

For a number of years, the production of geographic information has rested in the hands of private and governmental mapping agencies that spent billions to create large-scale geographic data sets, run frequent updates and provide geographical completeness. This costly process is a driver for the collection of only a limited and rigorous selection of geographic information – that is, the production of geographic information aligned to the narrow demands of certain administrations (see upper section of Figure 2-1) and enterprises or, at best, to the most popular everyday demands (e.g. navigation services), as the costs of production are very high (Fischer, 2010a). Google Maps, Bing Maps, Yahoo! Maps and not least the OpenStreetMap (OSM) have overcome these previous shortcomings. Free-of-cost geo-browsers have revolutionized the domain of consumer and citizen services, focusing on social location applications

for leisure, tourism, entertainment and political participation (Fischer, 2010b).

First, they provide a graphical interface for a global coverage of map and satellite data, following a model of free mapping services: the use is broadly free, but apart from OSM, the geo-data is not freely accessible. Secondly, geobrowsers provide a central functionality that allows combination with hitherto unavailable spatial web resources, for example a geocoding service that converts an address or place name to coordinates (Purvis & Svennerberg, 2010). In combination with their free mapping services and APIs (Application Programming Interfaces), new geo-aware media (or geomedia) have emerged that link, process and visualize content from multiple sources by geographic reference in a way that is seamless to the user. These are termed mapping mash-ups (Carl, Zund & Zund, 2008). The introduction of geobrowsers is commonly considered a landmark for the growth of the geoweb environment as they supported the colonization of a mass-market segment (see lower section of Fig. 2-1) of Internet users by spatializing web services (Fischer, 2010a).

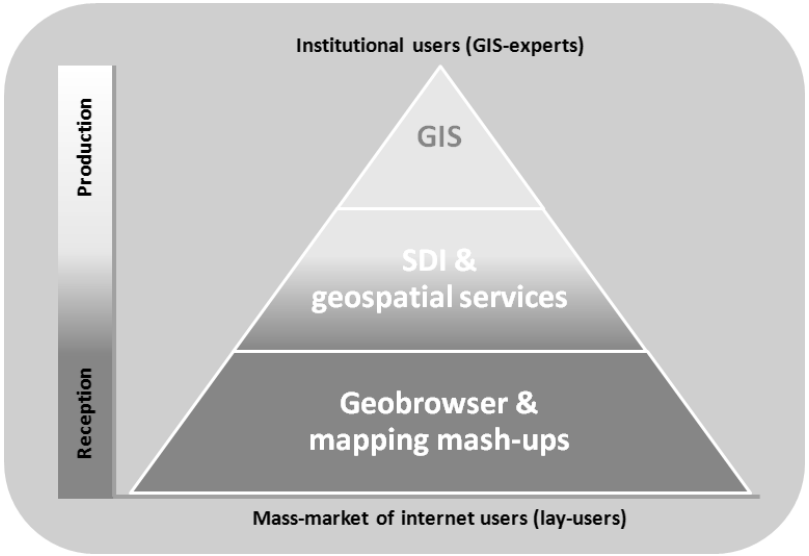

Figure 2-1: Geobrowsers serve the massmarket segment of Internet users, while GIS-experts produce and lay users consume geographic information (own illustration)

The shift of geomedia towards social software and geo-tagging lays the foundation for a 'democratisation of cartography' (Crampton, 2010, 37), i.e. the creation of a vast number of mapping mash-ups that bears upon everyday activities, and user-driven modes of production and co-production of geographic information. It is thus symptomatic of geomedia to absorb, or become conflated with, the social software domain, and let users share, collaborate and communicate through geographic information (Scharl & Tochtermann, 2007; Gordon, 2007; Crampton, 2010).

In order to organize these increasing streams of textual and non-textual information in online communities, and in web2.0 in general, geomedia-based communication became popular, allowing location to be the organizing principle (Lapenta, 2011). Various geomedia applications are linked to online communities, or are even entirely based on an approach to share, communicate and collaborate in online communities according to a common framework of orientation, i.e. geographically explicit references. These include text, audio, video or any other type of media that is linked to coordinates that reference a geographical territory by a geo-coded point, line or area. Geo-tagged communication in online communities radically changes 'the ways we visualize and understand the world around us – its places, geographies, and relationships' (Crampton, 2010, 37). Thereby it calls for an understanding of the practices of geo-tagging and how they are intertwined with everyday spatialities.

3 Mapping Becomes a Conversational Concept of Communicating

Geo-tagging for communication and cooperation in online communities is implemented on the level of the technological infrastructure by varying modes, degree and depth of prosumption of geographic information. It implies the negotiation of two key elements of spatial data that have, by then, been shaped by an institutionalized process: Location and Attributes (Schuurman, 2004) or 'properties z present at locations x', as Sui and Goodchild (2011, 1743) denote it.

Mapping as a process of communicating 'unary spatial knowledge' (Sui & Goodchild, 2011, 1743) from the expert to the user thus becomes a substantially more conversational way of communicating information between users. Those different, but not mutually exclusive, modes of prosumption extend the traditional broadcasting concept of producing geographic information driven by a linear map communication model (Crampton, 2010).

According to Schön et al. (2011), online communities can be divided into three classes dedicated to (i) sharing information, (ii) communication and (iii) collaboration. Applied to geomedia applications, these three modes of prosumption allow for a systematic overview of the conversational aspects of geomedia applications.

Sharing. Applications for sharing geo-tagged media resources are based on an approach similar to platforms for the sharing of photos (e.g. flickr.com), movies (e.g. youtube.com) or bookmarks (e.g. delicious.com). Active users share information about a location, such as their whereabouts, the situation on the roads on which they are driving, good supermarket offers, free parking places, emergency situations, and other observations about their everyday surroundings. All this information is captured and collected by the social location application and distributed to the online community in a process known as 'location-sharing' (Tsai et al., 2009). Facebook Places, Plazes.com, Dopplr.com and Google Latitude are exemple applications where users share their previous, actual or future whereabouts. Location-sharing is applied mainly in order to keep a geographical diary and to obtain information about the surrounding area, but it is also used to organize spare-time activities or meet up with nearby friends (Fischer, 2009).

Various social location applications exist for sharing outdoor activities in online communities, such as GPSies.com, Bikemap.net or Wandermap.net. In these online communities, active users share hiking and cycling routes, or jogging tours they have accomplished. All routes are compiled and made searchable by the platform operator. A multifaceted source of individual routes for outdoor activities emerges, enriching the structuring of the recreational experience (Fischer, 2011). An international stir was created by the application Ushahidi (ushahidi.com), a platform that informs 'crisis mapping' and empowers global citizen journalism by user-generated reports from political and areas of natural disasters, like Sri Lanka, Haiti, Japan or Kenya (Schenker, 2009; Bulkley, 2010; Naone, 2011). Crisis mapping is commonly understood as the creation, analysis and visualization of real-time data to support humanitarian response in crisis areas (Meier, 2009). Users of Ushahidi typically share reports from inside a crisis area by way of geo-tagged text messages and photos. This enhances a people-centred information collection for analysis and visualization by crisis reaction forces, help in the field, and an international audience. Generally the prosumptive activity of sharing establishes user-generated collections of geographic information that are

published to a mainly unrestricted audience. However, the collections might be filtered according to the privacy issues of the contributing users, or they might be intensively processed by the platform operator before being published.

Communication. Communication as a form of prosumptive activity concentrates on the discussion, collection and exchange of information, opinions and experiences bounded by geographical reference. Hence it aims at communication and opinion-forming about distinct locations. Examples are local search applications such as Yelp.com, Qype.com, Google Places or CitySearch.com, where active users contribute comments and ratings about services and goods within the everyday living environment. Like local search applications, the recreational platforms Outdooractive.com, Tripadvisor.com and DeineBerge.de allow users to review and comment on outdoor activities and accommodation. Platforms for public participation regularly encourage user-centred communication about places for urban planning and urban management. For example, applications like Wildurb.at or YouXcity.com are implemented to facilitate public discussion and opinion-forming about distinct locations.

Collaboration. Applications can facilitate collaboration between users to create geographically referenced content or services in a concerted way. In doing so, active users pursue a common goal, intention or challenge. A notable example is the OpenStreetMap (OSM) project, founded in 2004. Contributors to OSM (openstreetmap.org) aim to create a map of the world at no cost that is usable for all. Members of the OSM community capture geo-data about anything of interest and compile it into a database. Another example is Wikimapia.org, a free editable map that allows users to add information for any location in the world. It combines Google's digital mapping with a wiki system. Users can mark out a polygon to tag locations, and link text, video or any other media to it. Another form of collaboration is introduced by location-based games. They incorporate geo-tagging to link up material space with game space. The players interact with each other through geo-tagged locations in order to fulfil a task or to challenge each other, as with the applications Tourality (tourality.com) or FastFootChallenge (fastfoot.mobi). This gamification of space reconfigures spatialities as it supports new arrangements of socio-spatial practice and changes existing spatial settings (Fischer, 2013).

Degree and Depth of Prosumption. There are three basic ways of prosuming geographic information: community-based, editorial-based and aggregation. In addition to platforms based solely on the contributions of online communities, some platforms combine prosumption with data from mapping agencies or editorial-based content, such as Falk.de, Bing, Twitter Maps (www.microsoft.com/web/solutions/bing-twitter.aspx), which aggregates and geo-references tweets from twitter.com, as Google Places does to a certain degree, from various prosumed information sources. Furthermore, there is a difference in the depth of prosuming geographic information: on the one hand the capturing of locations of people, objects and resources by means of geographic coordinates, and on the other, the addition and enrichment of attributes of locations by means of a description, classification or discussion. Platforms may focus on both or either (Fischer, 2010a). Plainly worded and with reference to the conceptional construct of a Point-of-Interest, either the point or the interest or both are put in the prosumers' main focus of activity. Both can then be subject to user-driven enrichment, discussion and negotiation by mode, degree and depth of prosumption.

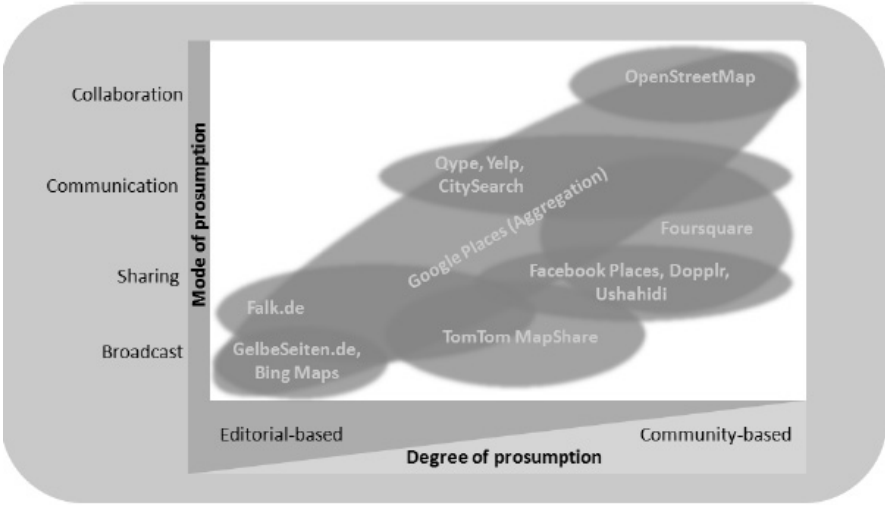

Figure 2-2: Classification of social location applications by mode and degree of prosumption (own illustration)

This overview depicts the range of models of cooperation and integration of user-generated geographic information in geomedia applications. It

provides an understanding of how user-generated geographic information differs conceptually from, and may supplement, institutionalized processes of collecting geographic information. Furthermore, it elaborates how mode, degree and depth of prosumption provide a general framework for the participation and cooperation of users, and how these different forms of interactions are transformed into geographic information.

4 From Mapping Space to Coding Space

While these transformations concern the very nature of geoinformation for knowledge construction about space and its embeddedness in everyday contexts, geomedia facilitate an ever-increasing interweaving with everyday spaces: they are interfaces that drive interactions with any spatial resource. In this way geomedia applications expand the perspective of geovisualization from task-orientated information retrieval for spatial decision-making to infrastructures that make an urban space of networked places searchable, accessible, negotiable and perceptible, and thereby also co-constitute it.

Social location services are typified as a new aspect of this kind of application, grounded on participative practices of authoring, dissemination and consuming distinct geo-coded tags, narratives and discussions, as on yelp.com, foursquare.com or bikemap.net, for example. Thereby, social location services provide additional technologies to create new contexts of negotiation, visibility, memory and anticipation that change the socio-spatial arrangements in cities (Gordon, 2008). This assumption is underpinned by general research on geographical information systems (GIS) and geography (Harley, 1989; Wood, 1992; Pickles, 1995; Elwood, 2007). Based on their work, social location services can be seen as serving as an intermediary for urban activities that produce new codings, practices and possible geographies.

However, it is arguable how users adopt certain sets of functionalities in the context of everyday urban life, eventually enacting urban space.

Rob Kitchin and Martin Dodge (2011) developed a concept of *code/space* and *coded space* in order to understand the logic of new media and their interweaving with space. In a *code/space*, people depend on software to do things and cannot do without it. In the related concept of *coded space*, software modifies or extends the production and functioning of space. Without software the spaces continue to function as intended but without any additional features (Kitchin & Dodge, 2011). Urban space needs to be considered as a context, being (re-)created by the ongoing, everyday practices of its users, such as inhabitants, tourists, workers, students or shoppers (de Certeau, 1984; Lefebvre, 1991). Progressing from

research on location-based services, urban space is considered by others as a context parameter of particular interest only (Reichenbacher, 2009). Paul Dourish (2004) describes this problematic positivist usage of the term 'context', stating that 'context cannot be a stable, external description of the setting in which activity arises' (Dourish, 2004, 2). According to Lefebvre (1991) and to Kitchin & Dogde (2011), space as a context is something people do and an outcome of the practice of everyday life.

As elaborated above, social location services provide different modes and degrees of coding space (and thereby of appropriating it) by user-generated geographic information. In the following paragraphs, this framework will be used to present the results of a study of the platform Qype.com in Berlin. The study examines practices of use, i.e. the ways of using the functionalities of Qype, and explores links between social location services and the lived spatiality of its users.

Editorial-based directory services create markets where indirect network effects between users and local businesses exist (Varian, Farrell & Shapiro, 2004). Their content is used by readers to orientate themselves in urban space, while local businesses pay the platform operators to be visible, as they expect readers to become customers. Hence editorial-based directory services are two-sided markets with two target groups: users and local businesses. The study will illustrate how a multi-sided market emerges with diverse links resulting from indirect effects and power relations among local businesses, Qype as a platform and users as customers, users as self-marketers and users who aim at social community forming. This transformation of a formerly two-sided market through the use of Qype induces new socio-spatial arrangements and diversifies the appropriation of urban space.

5 A Study of Qype.com

Qype provides a user-generated and geo-coded collection of Points-of-Interest (POI) that is searchable by address, district, topic and category of location. Registered users can add new locations, rate and review locations, and socialize through messages and forum discussions. In order to reconstruct how Qype is woven into the users' lived space of Berlin, 19 topical, in-depth interviews (Kromrey, 2006) were conducted with selected users of Qype over a period of four months. The interviews covered the topics of everyday urban life in Berlin, as well as uses of Qype and general usage of media. In the course of the study, recurrent themes were identified and categories were generated inductively. Using the constant comparative method (Strauss & Corbin, 1999), analysis of the interviews