GeoTagger: A Collaborative and Participatory Environmental Inquiry System

Jerry Alan Fails
Montclair State University
1 Normal Ave; RI-309
Montclair, NJ 07043 USA
failsj@mail.montclair.edu

Katherine G. Herbert
Montclair State University
1 Normal Ave; RI-318
Montclair, NJ 07043 USA
herbertk@mail.montclair.edu

Emily Hill
Montclair State University
1 Normal Ave; RI-321
Montclair, NJ 07043 USA
hillem@mail.montclair.edu

Chris Loeschorn
Montclair State University
1 Normal Ave; RI-109
Montclair, NJ 07043 USA
loeschornc1@mail.montclair.edu

Spencer Kordecki
kordeckis1@mail.montclair.edu

David Dymko
dymkod1@mail.montclair.edu

Andrew DeStefano
destefanoa2@mail.montclair.edu

Zill Christian
christianz2@mail.montclair.edu

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Abstract
This note focuses on the motivation, approach, and the initial prototype implementation of Geotagger: a collaborative participatory environmental inquiry system. We situate the need for such a technology, and discuss related work – much of which is situated in the realm of citizen science. Our work uniquely distinguishes itself from many other citizen science applications in that it supports limited data collection and analysis, with the additional benefit of supporting social interactions and engagement through conversations about observed data. This is accomplished by creating friends and groups which are collaborators in the observational inquiry process.

Author Keywords
Citizen science; children; collaboration; social; adventures

ACM Classification Keywords
H.5.3 [Information Interfaces and Presentation]: Group and Organization Interfaces – Computer-supported cooperative work.

Introduction
Technology has become a pervasive aspect of our modern culture. This proliferation of technology has impacted society as a whole, but in particular children. In the United States it has been estimated that 66% of

Related Work

Previous research has illustrated how mobile technology systems that allow users to create and add content can promote outdoor exploration [6]. Other investigations have surmised that people engage in citizen science for collective and intrinsic motivations rather than extrinsic rewards [11], thereby lending their expertise to enable crowdsourcing scientific inquiry. There are many systems that are related to the Geotagger system that we implemented, such as Pathfinder, Zooniverse, Zydeco, FieldScope, River Watch, and SciSpy. Many are related to citizen science, which has been defined as: "a form of research collaboration that actively involves the public in scientific research to address real-world problems" [15].

Visit bit.ly/GeotaggerRW for references to more related work.

8-18 year olds have cell phones, and that children in this age group interact with entertainment media for approximately 7.5 hours each day [1]. An apparent correlation between increased usage of technology and decreased experiences with nature [9, 12] has motivated some organizations to call for dramatic restrictions of technology use by children, some going so far as to position nature and technology as being diametrically opposed to one another [4]. While something indeed must be done, such a dramatic approach is not only unrealistic, but ignores the great potential that technology has to bring people together and encourage outdoor exploration. Instead, this work seeks to leverage children's affinity for technology to encourage children to explore their environment and to connect with peers and others as they create, share, analyze, and inquire about observations made in the world around them.

Geotagger allows users to tag items of interest in the real world, as well as to see tags created by their friends or groups to which they are associated. Children can have ongoing conversations about these tags through a comment feed about each tag. Adventures are sets of tags that can be configured for a specific purpose, like investigating certain plant types or habitats, or creating a treasure hunt.

As users interact with Geotagger, they are actively engaged in collaborative, constructive, and generative activities. By exploring real world spaces, children move and play with and are inherent activities for the social and cognitive development of children [8, 10, 14]. Geotagger supports these activities as well as engages children through peer discussions, collaborations, and competitions which again is beneficial to children's development and learning [3]. The hands-on construction and semi-public sharing of artifacts provide deep learning experiences and adhere to principles of both Piaget's constructivism [14] and Papert's constructionism [13]; where Piaget describes more the what and Papert the how [2].

Geotagger

Geotagger builds on the strengths of the systems discussed in the previous section, and enables a mobile, cloud-based system to support collaborative environmental inquiry. In this section we discuss briefly the design process for the system, as well as an overview of the system.

DESIGN PROCESS: Geotagger was initially designed and iteratively developed using the Cooperative Inquiry method where children and adults work together as design partners [5, 7]. Through several sessions over the course of a year and a half, that included low-tech prototyping, in field explorations with paper and medium fidelity prototypes, and sticky note activities, the underlying architecture and the terminology for the interface was formed. Through these sessions it was made very clear that: tagging would be fun; and that there was a need not only to share tags with the world (as many citizen science systems do) but also with close friends, and small groups. This allows for the de-anonymization or identification of the data. Therefore, the child's contribution is not lost in the data, but those who know you can see your individual contribution. Figure 1 shows some of the final sticky note analysis as well as in the field inquiry for some of the precursors to Geotagger.

Figure 1. Design sessions with intergenerational design team, in the field using prototypes, and sticky notes for informal evaluation of the prototypes in the lab.

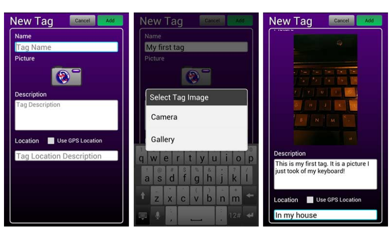

Figure 2. Creating a tag using the mobile interface.

SYSTEM OVERVIEW: The system includes profiles of the users and tags, typical of most citizen science projects. What is novel is that integral to the system is a social aspect where users can have friends or collaborators. The following subsections describe the major components of the system along with some screenshots of the mobile application used by children.

PROFILES: Each individual has an account, which can be tied to a single phone. Users have the ability to log in to their account and provide some minimal profile information.

TAGS: Tags are added by people who use the system (see Figure 2). Currently users can add a name, picture, description, a GPS location, and location and/or facets that can be searched. This is where primary observations are stored. In future iterations we imagine this component being customizable to allow for fields and types to be entered dynamically to meet the needs of the data at hand. Tags can only be directly edited or deleted by administrators or tag author. While tags are simplistic, it is the model of sharing and commenting and collaborating with friends and groups that are of particular import in the current version of Geotagger.

FRIENDS: One of the unique aspects of this citizen science system is that users can specify friends or collaborators. Users can view and comment on friends' tags, thus enabling conversations about each tag amongst friends.

COMMENTS: Comments are a mechanism through which users can have conversations about a specific tag. Comments can only be deleted by the tag or comment author. There is also an implicit comment that can be made without a textual entry, where children can give a star rating for the tag. The rating gets aggregated over time as users rank the tag. This is used to identify and prioritize more reputable or "interesting" tags.

GROUPS: Groups allow people to be grouped together, so groups can be subscribed to and then all tags and comments are accessible enabling collaboration. A class for example could be specified as a group and then class members would be able to see one another's tags and comment and collaborate.

ADVENTURES: Adventures are a set of tags that can be accessed by individual users or groups. A possibility for an adventure is a group of locations that a teacher wants children to visit and discuss. For example if there was an activity to visit different trees. Adventures have their own access controls so they can be configured for additional or limited functionalities.

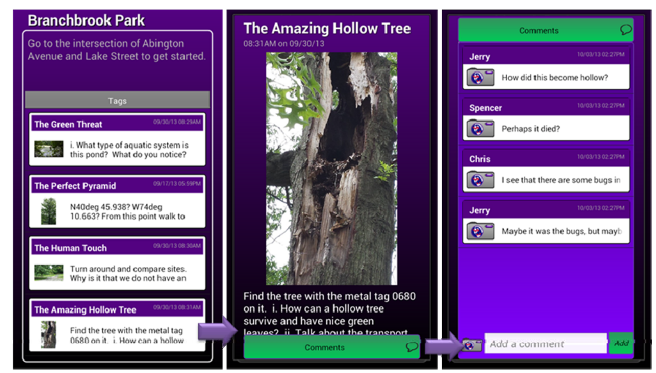

Figure 3. Adventure, Tag, and Comments mobile interface.

INITIAL FEEDBACK: The last iteration of feedback from the intergenerational design team was very positive. They particularly enjoyed tagging items of interest and sharing it with their peers.

Conclusions & Future Work

In this interactive poster paper, we have motivated the need for, and described a system that enables children to make environmental observations and facilitates conversations with friends and peer groups about the observations they or their fellow collaborators make. While many citizen science systems provide support for data collection or data analysis, our system provides limited support for both and adds a social layer that gives children a sense of accountability as their individual friends see their contributions, and allows for continued *in situ* conversations about tagged areas and items. We feel that such a system better supports collaborative and participatory environmental inquiry and will help children use technology to better connect to one another and their environment.

Acknowledgements

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