# Characterizing User Roles in HCI Technologies for Nature Exploration

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## Abstract
The exploration and the discovery of nature through walking, cycling, touring, trekking and hiking are targeted by this work, part of an on-going research on persuasive user interaction. Considering HCI solutions dedicated to discover and explore nature, we uncover several classes of roles that users may endorse during a long-term usage of such interactive solutions. We claim the importance of these roles as, leveraging persuasion, they may contribute to increase the nature discovery experience and to sustain motivation through user interaction. In this contribution we share the early insights from our first studies on the Mhikes platform, designed for such kind of nature-involved activities, and present our research directions for further investigations.

## Author Keywords
User Roles, Nature Exploration, Persuasion

## ACM Classification Keywords
H.5.m. [Information Interfaces and Presentation]: Miscellaneous; J.4 [Social and Behavioral Sciences]: Psychology, Sociology

## Introduction
Having your eyes on the mobile phone screen, reading notification messages, or in general, interacting with an electronic device are not the first actions we can associate with

the topic of nature. Nature-related thematic often involves scenarios of relaxation, meditation or reconciliation between body and mind in a general context of harmony coexistence with the environment. Technology, nevertheless, has found an important place in nature-related activities, and in particular, HCI has focused on two main perspectives in this domain: augmenting nature with information (learning purpose) and assisting explorers along the way (guiding purpose).

In the first part of this work we will be discussing a selection of related works on this two perspectives. Subsequently we highlight a missing characterization of roles that users may endorse while using such kind of HCI solutions. We then identify and propose four classes of roles suited for such kind of technologies. In order to illustrate our purpose, we provide examples based on the Mhikes platform, an application dedicated to hiking and touring, supporting content creation. Mhikes was created 3 years ago by the startup Easy Mountain, whose 10 employees are currently maintaining the application improving its features through research and development projects. The application counts at the moment 7000 users guided on 1100 available itineraries, and the exploration features have a Technology Readiness Level (TRL) level of 9 [4]. A few community features are also under development and testing (between TRL 5/6) and they will be addressed to the 3500 users that already follow Mhikes on social media. We conclude giving some insights for keeping high motivation in user interaction that approaches nature exploration.

## Related work

Keith Cheverst et al. in their work [1] underline how HCI solutions for exploration are often focusing on the learning purpose of technology. Some examples can be learning types of wood [6] or exploring biodiversity in nature [8].

| | **Single User** | **Multi User** |
|---|---|---|
| **Producer** | Creator | Leader |
| **Consumer** | Walker | Follower |

**Figure 1:** Roles of users involved in nature exploration

Other studies focus instead on the collaborative approach, as for example the work of Miura et al. [5]. The work of Rosner et al. [7] takes a different approach on how users could be motivated by exploring an itinerary created and shared by another user. In particular, the path is discovered along the way and it turns into a secret message embedded by the creator.

The analysis of the related works evidences how a distinction between users that *create* contents and users that *consume* contents is implicit: when users create contents they are creators, when they use the contents are consumers. What we suggest is to adapt the HCI solution depending on the role endorsed by the user with dedicated features, to enhance the user experience. In the same way, when the technology (e.g. mobile-phone) is shared among a group of users in a collaborative manner, roles endorsed by users emerge: the role of the users *leading* the activity (ex. reading information on the screen) and the role of people *following* (ex. relating the information on the environment) that do not have dedicated HCI controls/features.

Summarizing, we argue that discovering (nature, environment) embeds the aforementioned roles with an implicit characterization and we propose to make it explicit by supporting our insight with the experience gathered working on the Mhikes application.

## Discovering nature: roles

From the related works discussed above, we evidence different categories to classify the role of users in nature exploration. Our analysis highlights indeed how two main axes, represented in Figure 1, seem to characterize the role of users. The first axis characterizes if user execute single-user tasks (Single-user) or if they use the technology collaboratively (Multi-user). The second axis describes if

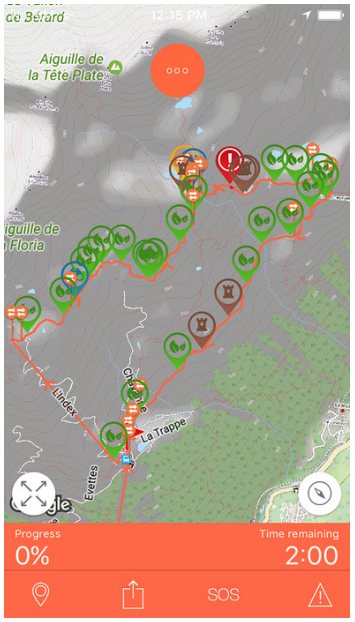


**Figure 2:** Creators tracing an itinerary with points of interest on the Mhikes application.


**Figure 3:** Walker safely exploring nature following the instruction provided Mhikes.

users produce new resources for the exploration (Producer) or if they just use the ones that are available (Consumer). We can indeed find four main roles for users combining the aforementioned scenarios. For each role we will be giving a definition with a short example.

**Creator (Single-user, Producer):** creators add new content for nature exploration as cartographic resources, environment information or experience tips. They are expert in something and eager to share their experience with others. However, their creation task does not involve other users in principle.
*Example*: creators of Mhikes itineraries use the Mhikes application to trace a GPS route of a certain itinerary physically walking on it. While walking they take pictures and other multimedia contents creating Points Of Interest (POI) enriched with their own explanations. Once completed, the GPS trace is refined using the Mhikes back-office algorithms and, once ready, the content is made available to the entire community (Figure 2).

**Walker (Single-User, Consumer):** walkers use the contents provided by the technology. They take advantage of the technology to be safely guided along the exploration and they are interested in augmenting the experience with multimedia contents to learn and discover more.
*Example*: Mhikes users use the application to safely remain on the itinerary. Pop-up messages show photos of crossroads with arrows and voice messages to choose the appropriate path. Once in proximity of a Point Of Interest, dedicated contents are shown to learn about plants, flowers, and other environment key aspects (Figure 3).

**Leader (Multi-User, Producer):** leaders are users that create and organize activities using technology. They use the technology to achieve their primary objective of exploring nature, and secondly they take advantage of the activity to gather other people such as friends, or other users with common interests or similar profile. They are eager to share through social activities. Jointly, leaders may also share useful resources such as transportation means and/or specific equipment dedicated to explorations (ex. technical cloths).
*Example*: Mhikes leaders are the users that organize weekend-walks and/or nature-related group activities to experience together nature.

**Follower (Multi-User, Consumer):** followers are users interested in nature exploration but not sufficiently motivated to create contents or to organize nature-related social activities. On the other hand, invited by a leader or a friend, they are happy to participate to such kind of activities. They are possibly lacking motivation in organizing, but this is not reflected by a negative mood during the activities. On the contrary, they are enthusiastic of sharing social activities and thankful to the organizers.
*Example*: In Mhikes, community features are under development and followers are actually a simple group of walkers. Similarly to social media, in the future followers will have access to features that will facilitate connections with leaders. In such way, they will be able to follow the leaders for a walk in the nature, in an exploration or in other kind of already organized activities.

## Re-Discovering nature: a new role for users

The primary goal of this study is to use HCI to maintain user's motivation for nature exploration through user interaction. Implementing the distinction between the four roles may not prevent users from loosing interest in exploration: repeating the same tasks associated to a given role, may not result interesting. For this reason, it is necessary to give

users new perspectives and consequently, making their role in the technology evolve.

Users that want to try exploration for the first time have different needs compared to expert ones. The beginners may just want to be safely guided and to receive information along the exploration. The expert ones may "*need more*" as for example, creating their own itinerary. In both cases, repeating the task without giving a different perspective, may lead not only to loose the interest in using the application, but potentially to lose the interest in the whole exploration activity.

We propose to embed features in the HCI technology that persuade users to switch roles, for example, passing from a *walker* profile to a *creator* and conversely. The same change can also happen between the others roles. For example, followers, used to wait for organized activities, may decide to change their approach organizing their own explorations. In the next paragraph we will be discussing what are the factors and the persuasive means that may convince the user to switch role.

*The experience factor*
We have mentioned that experience matters in deciding to switch roles. We underline that experience is related not only to the know-how in exploration, but also to the knowledge of the environment. For example, an expert, for a given location she/he knows well, may be a producer. Conversely, while traveling in a new environment, this expert may endorse the role of follower joining an exploration group.

*The similarity factor*
Localization does not impact only on experience but it is also a form of similarity between users. Similarities can relate to common interests, shared background or common friends. Walkers may find out that content dedicated to their interests is missing in the available activities. This may lead them to switch roles, becoming a producer of such content or a leader of a group of exploration enacting a collaborative group-working.

*How to leverage the switch*
Research in HCI associated to persuasive technology has shown plenty of techniques to trigger, induce and support a behavior change. For example, consumers may be persuaded in becoming creators or leaders, with the aim of being rewarded by other consumers. Reward can be based on social feedback (provided by friends or by community members) or simply on a self reward (successfully reaching a targeted goal) [2].

The moment in which the change should happen, may also depend on intrinsic variables related to the users (motivation and ability) [3]. For example, proposing a consumer to become a producer demands a level of ability that a beginner may not have, and a failure may lead to frustration. For this reason, before suggesting users the possibility of a role-switch it is necessary to investigate what is the context in which such kind of notifications are more effective.

## Conclusion
In this work, we have evidenced how HCI solutions for exploration usually implement implicit roles in their technology. We characterized four classes of roles that users may endorse, according to two axes: a single/multi vs. consumer/producer usage, giving concrete examples. Finally, we discussed why users should switch their role over time, evidencing some factors and approaches that may lead to this change.

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