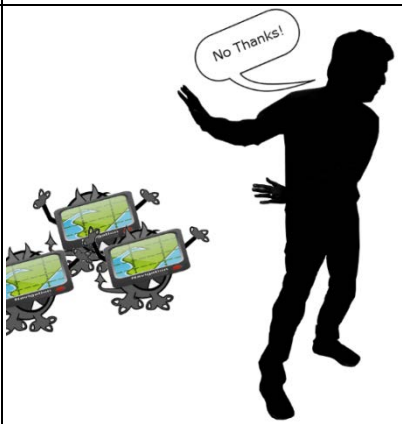
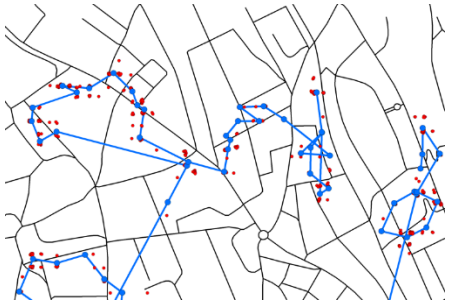
Chair:	**Geoinformations-Engineering**
Supervisor:	Prof. Dr. Martin Raubal
Advisors / further supervisors:	David Rudi, Dr. Peter Kiefer, Vasilis Anagnostopoulos
Thesis Title:	**Using vibro-tactile feedback to communicate object movements in space**
Abstract:	Vibro-tactile feedback has been used in different scenarios, such as to give navigation directions or to simulate haptics for remotely operating surgeons. While vibro-tactile feedback has also been used to guide car drivers' attention in a given direction or to provide collision information, it has not yet been used to communicate movements of different objects around people.  In this thesis, the student will develop a wearable device, which is able to represent the movement of objects along a person's path, using vibrational cues. Requirement: knowledge of Android programming, as taught in the Master course "Mobile GIS and LBS".
Particularities (e.g. comments on group work etc.):	A more specific introduction into the topic will be given by one of the advisors upon request.
Group work: **Number of students per group:** **Total number of students per theme:**	No

Chair:	**Geoinformation Engineering**
Supervisor:	Prof. Dr. Martin Raubal
Advisors / further supervisors:	Ioannis Giannopoulos, Dr. Peter Kiefer
Thesis Title:	**Pedestrian navigation systems and user acceptability issues**
Abstract:	 When humans navigate in unfamiliar environments, they often make use of navigation systems that help them reach their destination. These navigation systems range from typical map-based approaches to very futuristic vibro-tactile approaches that “guide” the wayfinder through the environment. Although wayfinders utilize assistance systems, navigation problems still occur. The main reasons that lead to these problems are related to the spatial abilities of the individual wayfinders and technological limitations, among others. For instance, a navigation problem can occur if the wayfinder is not able to match a given navigation instruction to the surrounding environment in order to make a correct decision. Attempting to address this kind of problems, new navigation systems try to minimise the wayfinding actions that have to be performed by the wayfinder. Although several navigation systems proposed in the research literature are able to address the aforementioned problems in a very successful way, questions concerning user acceptability of these systems have been raised. The reason for this is that since the wayfinders do not have to solve spatial tasks anymore, e.g., match a map instruction to the real environment in order to make a decision, and they just have to rely on the abilities of the system, a patronising effect, among others, can result. The student will perform a thorough literature review on the area and highlight the major differences between the existing navigation systems and point out the problems concerning acceptability that can arise. Moreover, an experiment will be designed and performed in order to assess the user acceptability of such systems.
Particularities (e.g. comments on group work etc.):	A more specific introduction into the topic will be given by one of the advisors upon request.
Group work:	No

Chair:	**Geoinformation Engineering**
Supervisor:	Prof. Dr. Martin Raubal
Advisors / further supervisors:	Ioannis Giannopoulos, Dr. Peter Kiefer, Dr. Paul Weiser
Thesis Title:	**Whom should I ask for directions? A P2P approach for direction recommendations.**
Abstract:	Humans engage daily in wayfinding tasks, trying to reach a destination in environments they are unfamiliar with. In order to reach their destination, wayfinders often make use of assistance systems that guide them through the environment. Although these systems are very helpful, sometimes wayfinders have problems with one or more steps of the wayfinding process. For instance, sometimes it is difficult to interpret a given instruction or the destination cannot be recognised. In these situations, wayfinders tend to ask other pedestrians in their surroundings for help. Once a wayfinder decides to ask another pedestrian for help, one of the questions that arises is "whom should I ask for directions?". Not everyone has the information a wayfinder is seeking for, thus, randomly asking other pedestrians for help can result in losing a lot of time until someone able to provide help is found. Moreover, the given instructions might be of poor quality or even incorrect.  The student will perform a thorough literature review on the area and come up with possible solutions in order to design a system that can be used to get directions from an optimal pedestrian in the surrounding environment. A prototype of the solutions will be implemented and empirically evaluated.
Particularities (e.g. comments on group work etc.):	A more specific introduction into the topic will be given by one of the advisors upon request.
Group work: **Number of students per group:** **Total number of students per theme:**	No

Chair:	**Geoinformation Engineering**
Supervisor:	Prof. Dr. Martin Raubal
Advisors / further supervisors:	Dr. Peter Kiefer, Dr. Arzu Cöltekin (Uni Zürich), Prof. Dr. Sara Fabrikant (Uni Zürich)
Thesis Title:	**Collaborative spatial decision making during wayfinding: an empirical investigation using eye tracking**
Abstract:	 Spatial decision problems are often solved collaboratively by a group of two or more people. For instance, two travelers may have to find their way from the train station to a hotel, each knowing only parts of the spatial surroundings. Of great importance for the success of collaborative spatial decision making is an effective communication about spatial concepts between the involved decision makers. Two wayfinders, for instance, might be talking about the same symbol on the map, but refer to different landmarks in the real world. Mobile eye trackers can be used to record where a person is gazing at in a mobile situation. By combining data from audio recording and gaze tracking of two wayfinders during collaborative decision making, it may be possible to gain insights on the reasons and types of communication errors that occur. These insights are useful for engineering mobile assistance systems that help in spatial decision making. In this MSc thesis, the student will elaborate a detailed research question, will design and perform an empirical study, and evaluate the collected data. The two eye trackers necessary for the experiment are available through cooperation between ETH Zurich and University of Zurich.
Particularities (e.g. comments on group work etc.):	This topic is collaboratively advised by the Geoinformation Engineering group at ETH Zurich and the Geographic Information Visualization & Analysis division at University of Zurich. Part of the supervision will be in English.
Group work: **Number of students per group:** **Total number of students per theme:**	No

Chair:	**Geoinformation Engineering**
Supervisor:	Prof. Dr. Martin Raubal
Advisors / further supervisors:	Dr. Peter Kiefer, Prof. Dr. Peter Widmayer
Thesis Title:	**Intention recognition from gaze while interacting with geographic maps**
Abstract:	Intention recognition is the problem of algorithmically detecting an agent's intentions from her behavior. Previous approaches have, for instance, focused on recognizing a mobile phone user's intentions from her GPS trace. In this thesis, the student will develop new methods for intention recognition from gaze data recorded during a user's interaction with a geographic map. Gaze data are collected with eye tracking technology and come as a temporal sequence of screen coordinates, indicating where on the map the user looks at. An intelligent gaze-based assistance system would recognize the user's intentions and automatically adapt the map, such as change the zoom level, pan, or highlight information. This minimizes the need for explicit interaction via standard interaction modes (mouse, swiping etc.) and therefore cognitive load of the user. Intention recognition can be formulated as a problem of reasoning under uncertainty, with sensor inaccuracy, ambiguity, and model learning as major challenges. Previous approaches have tackled these problems with dynamic probabilistic models, such as Dynamic Bayesian Networks.  The student will develop an algorithmic approach for intention recognition from gaze data for a limited number of typical map tasks. As part of the thesis the student will collect a small eye tracking corpus.
Particularities (e.g. comments on group work etc.):	This topic is co-supervised by the Algorithms, Data Structures, and Applications group at D-INFK and the Geoinformation Engineering group at D-BAUG. The mobile eye tracker is available from the Geoinformation Engineering group (at Hönggerberg). A more specific introduction into the topic will be given by one of the heads or by the advisor upon request.
Group work: **Number of students per group:** **Total number of students per theme:**	No