Roads and Streets - A Common Place for Interaction

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ABSTRACT

Since the beginning of the field of CSCW in the 1980s its main focus has been placed on supporting collaborative activities at the work place. Recent research trends, however, have tried to explore the use of technology to support interaction and collaboration between people and objects on areas other than office spaces or control rooms. This paper remarks the importance of considering cities' streets and roads as major locations for social interaction where unnoticed cooperative and competitive activities are constantly in motion. It also comments on previous works that have tried to raise this issue and introduce technology to support and encourage the interaction between road users.

Keywords

CSCW, Pervasive Computing, Design of Interactive Systems, Road Usage, Traffic

1. INTRODUCTION

In the early days, most of the research and literature on the field of CSCW has aimed to improve cooperation at the workplace (hence the acronym for *Cooperative Work*). However, recent studies are taking into consideration other areas for collaborative interaction, such as education, entertainment, public transportation, etc. In the last few years Oskar Juhlin et al. have recognized *the road* as a common location where social interaction is constantly taking place under various altering situations. He states that "road-users affect each other all the time in local contexts ... road usage can be viewed as a co-operative activity ... [Road] users must show consideration and adapt their activities to each other" [7] to ensure a harmonic use of the roads which are used by many people at the same time and often for different reasons. Obviously, the main purpose of communal streets is for vehicles to displace from one point to another. This in turn brings, in part, comfort and convenience for human beings, or at least, in this case, for those who have a vehicle. Also in the Middle Ages, roads were created to allow horses and carriages to navigate through cities, and even then a certain level of coordination was required so that the flow of those carriages was not unnecessarily interrupted, specially through the narrow streets existent at the time. But, of course, vehicles are not the only users of the roads; pedestrians, cyclist, skateboarders, food-stand owners, animals, among other things and creatures are its daily occupants. In a normal day all of these road users unconsciously interact with one another to a greater or lesser degree, but always affecting each other's actions and mutually influencing their behaviours. In this context, what Juhlin fails to consider is that the occurring interaction on roads and streets is not always a *cooperative* one but, under some environments, it could also be seen as a *competitive* activity. Nevertheless, understanding the vast significance of the roads and streets as a medium for social interaction might be of critical importance for the growth of future human relations and of interests for flourishing societies. More important is the proper adaptation of new technologies embedded into the street environment to support and encourage positive interactions.

2. THE STREET ENVIRONMENT

2.1 The Street as an Information Space

As other CSCW research perches its environment in the settings of an office, under this discussion the environment can be seen as the public street on any given city. This street environment is enriched with objects that convey information. Some of these objects are purposely made to achieve some control over the street environment, such as traffic lights, traffic signs, speed bumpers, etc., while others are casually positioned as informal indicators for road users to take into consideration and react accordingly, ranging from car accidents, to an animal crossing the road or to common/uncommon street sounds. Analogically, the use of offices' memos could represent traffic signs on the streets, which have the purpose of acting as communicational artefacts for people to coordinate their activities and to be aware of their environment in a subjective manner, thus becoming a kind of *information space*, which is under constant modification by the action of road users. Although slightly different from the information space proposed by Bannon and Schmidt [1], who refer to shared information under office settings, this information space implies the space filled with shared cues, guidelines, knowledge, advice and other kind of data where road users are able to navigate while acquiring and distributing this information for themselves and to others using the same roads. In this context it can be seen rather as, what Sörgaard proposed, *shared material* since they act as the means for participants (i.e. road users) to mediate their actions [10].

It can be argued that this information space has a predefined setting built by cities' traffic planners or governmental institutions. For instance, in most cities and highways people adapt the speed of their vehicle according to the predefined speed limits imposed by the traffic officials and em-

bodied as signs on the roads. If these settings, which enforce a certain level of compromising, are disregarded, the individual is penalized by the law. However the driver has to be aware of the speed limit on that particular setting, and this is done by visually locating the speed limit sign on the road or by previously knowing the limit on that particular road, or perhaps by being unconsciously aware that other drivers do not exceed a certain speed, thus coordinating one's own velocity with theirs. Another example is the event of an individual who wants to cross the street, an action so common that requires no conscious reflection and comes natural to the individual performing it. However, there are a number of unconsciously taken steps to be followed in order to lawfully achieve this objective. First, the individual has to visually locate the traffic light where, usually, the zebra crossing is situated. Once found, the individual has to head in the direction of the traffic light and start walking, with the possibility of encountering other individuals on the way and therefore coordinating his activities with theirs. As soon as the traffic light is reached the individual has to either wait for the sign to be green or cross immediately if it's already green, taking notice of the presence of cars even when they are supposed to stop at the light.

Notice that these scenarios are characteristics of streets in a calm city or a developed country, where the infrastructure and social laws allow for this kind of actions to happen. However, some big cities and developing countries are known for the complete disregard of traffic laws, where speed limits are just a theoretical concept and traffic lights are only suggestive. Therefore, under these environments, the previous examples, which could be seen as cooperative type of actions, do not apply. Instead, road users on this context look mostly for their own benefit at the expense of other's safety or concerns. For this reason Juhlin's suggestions would not completely pertain on, say, the streets of Mexico City, where pedestrians have the lowest priorities, the levels of stress while driving are quite significant, and introducing Integrated Transportation [6] would be chaotic and impossible. On a city like this a typical driver would speed up instead of slowing down when the traffic light signals yellow, thus forcing the cars at the other side of the intersection to be extremely aware of the presence of crazy drivers rushing to cross even when the light is already red. Pedestrians, who are not obliged to cross the streets at the intersections, will have to wait until no cars are near and then run across the street. Drivers in this case have to be constantly aware that no person or animal is crossing the street with carelessness.

In short, the street present a space where there exists a constant interaction for *driver to driver*, *driver to pedestrian*, *pedestrian to street signs*, *pedestrian to pedestrian*, etc., and which is full of shared information that is available to all road users (making it *transparent* in a way) but constantly changing by the action of these actors. The occupants of this space could unintentionally behave in a collaborative or in a competitive manner, depending on the location and the circumstances, but regardless of the type of interaction the information is always present.

2.2 Articulating the Street Environment

The definition of articulation by sociologist Anselm Strauss [12] can be applied to a typical street environment. There are three main characteristics of articulation. First is the interconnectedness of various clustered tasks, which can be seen in a road where multiple activities are happening at the same time. Secondly is the combination of efforts of the various units, which correspond to the collaboration of road users in order to prevent accidents or conflicts. Finally, the mixture and blending of various actors performing different actions with different kinds of tasks; which can be seen as the different roles of individuals on the streets (car drivers, bus drivers, pedestrians, passengers, cyclists, etc.) trying, unconsciously, to integrate their actions. However, as Bannon and Schmidt assert, the environment on the street could not be fully articulated since "environments characterized by task uncertainty, due to, e.g., an unstable or contradictory environment, task allocation and articulation cannot be planed in advanced" [1]. Instead, events in this kind of environments are ever-changing, moment-to-moment unplanned reactions to the surrounding actions of others, or what Lucy Suchman calls *situated actions* [13].

Nevertheless, the examples mentioned above present good instances of the superficial articulation of specific common road situations. They exemplify the need for visual contact and peripheral awareness for cooperation under the street environment. Therefore, a system designed to support collaborative activities under a street environment would have to explore, and rely heavily, on the use of humans' sensory perceptions and their capacity to attend to secondary events acting on the periphery.

3. INTERACTIONS ON A STREET ENVIRONMENT

The previous section tried to remark the importance of perceiving roads and streets as a *space* for interaction and trying to articulate some of the events that occur on them. The observation of the central fact that a road is a common setting for social contact is well portrayed by Oskar Juhlin by saying that

> Road use is understood as a cooperative activity, since a number of actors share a common resource (the road) and through its use change the conditions and possibilities for other users. They are forced to show consideration, or at least adapt their activities to each other, that is to coordinate them, in order to avoid accidents and disturbances [5].

However, this statement is somewhat incomplete by failing to consider the possibility that the interactions on the streets could not only be a cooperative action but also a competitive one. A cooperative activity implies the association of two or more persons working together to carry on a common interest that will bring them mutual benefit. An important aspect to bear in mind is the fact that the act of driving in populated cities, for instance big cities of developing countries, as exemplified previously, where road regulation and traffic authorities are sometimes not taken seriously, is characterized by aggressiveness and selfishness. Drivers strive to avoid a calamity (accidents and disturbances), nevertheless they mostly keep their on benefit in mind, disregarding the feelings and safety of other road users around them. However, interaction always exists among drivers, either in a positive or in an unhelpful way, and interestingly enough,

failure to act aggressive and selfish might disrupt the normal course of evens that road users of these types of environments are used to. Thus, technologies to be developed for traffic interaction should definitely consider all aspects of the driving experience, and realize the potential benefits that positive coordination of road user's maneuvers and decisions can bring to the flow of traffic. Although hard to capture, the driver's experience is what counts the most. This experience can be very subjective and is greatly dependent on its contexts, which makes its challenging for interaction designers to devise for.

The most common form of interaction on the roads is perhaps among drivers on the same street. The activity of coordinating car movements with other co-present drivers has been pinpointed as *Traffic-encounter interaction*, which consists on capturing others intentions through visible maneuvers and gestures as well as divulging your own to the nearby vehicles. Its three main components are the drivers, the vehicles and the streets where the vehicles are driven. Encounters between these entities are ruled by situated actions and are of a brief and spontaneous nature [9]. This type of social interaction reveals itself to be extremely complicated if studied cautiously. In particular, driving a vehicle on big cities can be proved to be extremely complex with high levels of meticulous details and including multiple instances of traffic-encounters. When a person responds with a particular reaction to a particular event, the persons around him can dictate their next movements by a set of heuristics and schemas, which in turn affect the response from other individuals around them. This form of intertwined interaction is what Ervin Goffman refers to as *performances* or "the activity of a given participant on a given occasion which serves to influence in any way any of the other participants" [4].

At the same time, driving either in traffic or places where cars travel at great velocities and with continuous sudden movements can become a constant source of stress and frustration. On the other hand, "any driver is surrounded by several others and yet they may all feel lonely" [9], since there does not exists a way of tangible communication between fellow drivers.

Interaction between drivers, however, is not the only kind of interaction on the road. Little research has been done on analyzing the relationship across drivers and other road users. Pedestrian encounters are also quite common events occurring all the time on the streets. In the same way that vehicles manipulate their directions, pedestrians also have to be aware of fellow pedestrians around them and coordinate their activities in order to not occupy the same space at the same time. The difference is that face-to-face interaction is indeed possible between pedestrians, with the inconvenience that most times a trigger that initializes the interaction does not exists, thus passing unnoticed. Bus-stops, for example, are ideal locations for starting conversations; nevertheless in countries like Sweden this opportunity is usually disregarded, while in Latin America it is a common place for people to engage in a dialogue. It would be interesting to see the effect of a system that tries to encourage communication between individuals on a road of a Scandinavian city, and examine the cause for the lack of communication between strangers characteristic of Nordic countries. By the same token as before, the interaction between pedestrians could also present itself as a competitive form of interaction. Searching for a taxi, for example, or trying to get inside public transportation at rush hour, could incite competitiveness for power and space among pedestrians.

Understanding the different kinds of interaction on the road as well as the moment and the context in which they take place is an essential prerequisite in the design of new technology intended to support social relations and collaborative activity on the roads.

4. ENHANCING ROAD INTERACTION WITH TECHNOLOGY

A system meant to support collaboration on the roads might beget invaluable advantages. Not only could it make the driving experience an interesting and pleasant one, it also "might help bridge different social groups, values and attitudes, to potentially mediate the communication of varied subcultures" [3]. As of now, the only way of revealing an individual's intention while driving is through means of the car's horn, blinking lights, hand and head movements and visual gestures. A new, technologically oriented, way of divulging these intentions is certainly necessary on new manufactured vehicles as well as embedded on the roads. Juhlin has identified this need and has suggested possible solutions to the issue of road users' interaction. For one, he proposes to emphasize the aspects of the existent technology that are known to promote interaction, such as email, mobile phones, videoconferencing, etc., and apply those to the improve social interaction in road traffic contexts [7]. He also has tried to explore better ways for bus drivers to communicate and coordinate in order to achieve *Integrated Transportation* [6]. These suggestions follow the idea that the introduction of technological artifacts into the road has to be careful enough to indeed support cooperation on the road and not disrupt the common practices already learnt by people. [1].

In the search for ways to enhance road traffic interaction with the help of technology, designers and researchers, such as Juhlin, are exploring new ideas and concepts. For instance, *Sound Pryer* [8] is an in-car entertainment application intended to add value to mundane traffic encounters by wirelessly connecting vehicles with the idea that drivers whose cars are close to each other can have the option to listen to the music being played by neighboring cars, thereby engaging in short encounters that create playful enjoyable interaction between drivers, thus encouraging interaction through curiosity on the other drivers' taste for music [8]. In a way, it could serve as the trigger, or the excuse, to establish a conversation and make new friendships.

Another example is *Road Rager* [2] based on the creator's assumption that physical presence during temporary encounters would enhance a mobile gaming experience. Taking advantage of the technological advances of mobile technology, the designer of Road Rager developed the idea of drivers playing a game even when their encounters are short and spontaneous (the concept of the game can be read in [2]). Perhaps it could be convenient for the developers of mobile games to take advantage of the characteristics of these short and spontaneous interactions and include these as part of the role of the game.

Finally, another, perhaps a little futuristic, way of enhancing vehicles with technology and make the drivers aware of their surroundings, could be to augment the car's windshield

with some kind of semitransparent video display. The display would act on the driver's periphery without requiring his full attention while at the same time being informative, entertaining and pleasant. For example, the driver could request to start a videoconference with the adjacent car, displaying on the windshield (on the passenger side) the image of the other driver along with the audio. Hence, the two drivers could maintain a conversation with video and voice while driving along the same road or being stock in a traffic jam. As with Sound Pryer, this would serve as a motivator to start conversations or maybe even as a good way for communicating between people already acquainted.

Sound Pryer and Road Rager have been developed and perhaps tested keeping in mind the settings of a typical Scandinavian city. Certainly these systems would have different impacts on societies with different characteristics, since different locations provide different experiences. In environments characterized by competitiveness, technological artifacts would ideally aim at reducing competition in the streets and provoking more friendly environments with more gracious interactions. For instance, new ways of signaling intentions to others (such as changing lanes, turning left, looking for parking, etc.) through various innovating forms of sounds, lights or wireless systems would perhaps get rid of the common misinterpretations of communications. Moreover, to discourage aggressiveness and selfishness one could think of a system that enables its user to automatically report other drivers' misconduct to the authorities. The proposed Sound Pryer itself might be a useful tool to have for the event of a big traffic jam (often occurring in big cities) where people can take the opportunity to interact with others, make new friends and inform themselves of their surroundings, instead of being annoyed and impatient while stock in traffic.

5. CONCLUSIONS

The intention of this paper is to create awareness on the importance of roads and streets as a place for social interaction, where not only cooperative activities take place but also competitive ones. These activities, although mostly unintended, unconsciously affect other road users and their momentary actions. This is a fact that is usually taken for granted by the general public, traffic officials and city planers. However, realizing the potential of the seamless enhancement of communication and cooperation among road users (drivers, pedestrians, cyclist, etc.) with the aid of technology could result into a greater good for societies. This would be achieved by creating harmony among road users, by making driving an enjoyable activity and removing the frustrations and annoyances that could come with it, by encouraging spontaneous interaction among drivers and people on the streets, and, in general, by creating a cooperating atmosphere between citizens. Of course, a change of such magnitude might take years to develop but hopefully would produce rewarding results, perhaps by increasing living standards, raising levels of happiness among citizens, making people more friendly and at the same time more productive, and reducing the level of accidents (or negative interactions) on the roads.

There are many things that ought to be considered when talking about interactions on the streets. It is hard to cover the vast range of topics that are opened to discussion when touching this subject. However, it is an ample and interesting topic that, if rightly exploited, could contribute in many positive ways to the fruitful upbringing of societies.

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