Communications Protocols for Athlete Monitoring

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Project Aim:

The overall aim of our project is to create a mobility and radio connectivity model to help design communications protocols for highly mobile body-worn ad-hoc sensor networks. In order to achieve this goal, we have to understand the radio propagation characteristics of body worn wireless sensor systems. The paper we will be presenting at LCN is a crucial first step towards this goal, wherein we devise a model which ties the received signal strength to the distance and orientation from the sender. Our demo takes us one step further. Here, we illustrate an ad-hoc network formed between soccer players in a soccer field, during a live game.

Relation to accepted paper:

Our overall goal is to extract data from players and to be able to re-create a soccer game in real time. In order to achieve this, we need to know the effect the human body has on the transmission range of the sensor motes. The paper submitted to LCN looks at the effect that the human body has on the signal strength.

Our demonstration on the other hand shows a larger scale experiment whereby strap GPS loggers onto players and record them during the game. From this we are able to determine the position of a player in the field and the orientations between each player.

Combining the model in the paper with GPS traces, we are able to determine the network connectivity between all players for the duration of the game. This data will be invaluable in devising a communications protocol which can be used in such networks.

Figure 1. Screen capture from video footage

What we will show:

During our experiment, we took video footage from the sidelines of the soccer game (Shown in Figure 1). We augment this video with the visualisation of the GPS traces of the player movements (Shown in Figure 2). This way we are able to get an objective player location to match the video.

Using this, we apply the model presented in the LCN paper to determine the instantaneous radio connectivity between different players. This will be shown in a third window.

Thus, our demo will take us from a video representation of the player movement, through to an objective location-based representation of the players using GPS data, and finally to a network representation of the connectivity between players and from players to the base stations. The strong visual emphasis of our demo will aid greatly in understanding the challenging operating environment encountered in this dynamic setting, and will strongly convey to the audience the need for novel communications protocols in this setting.

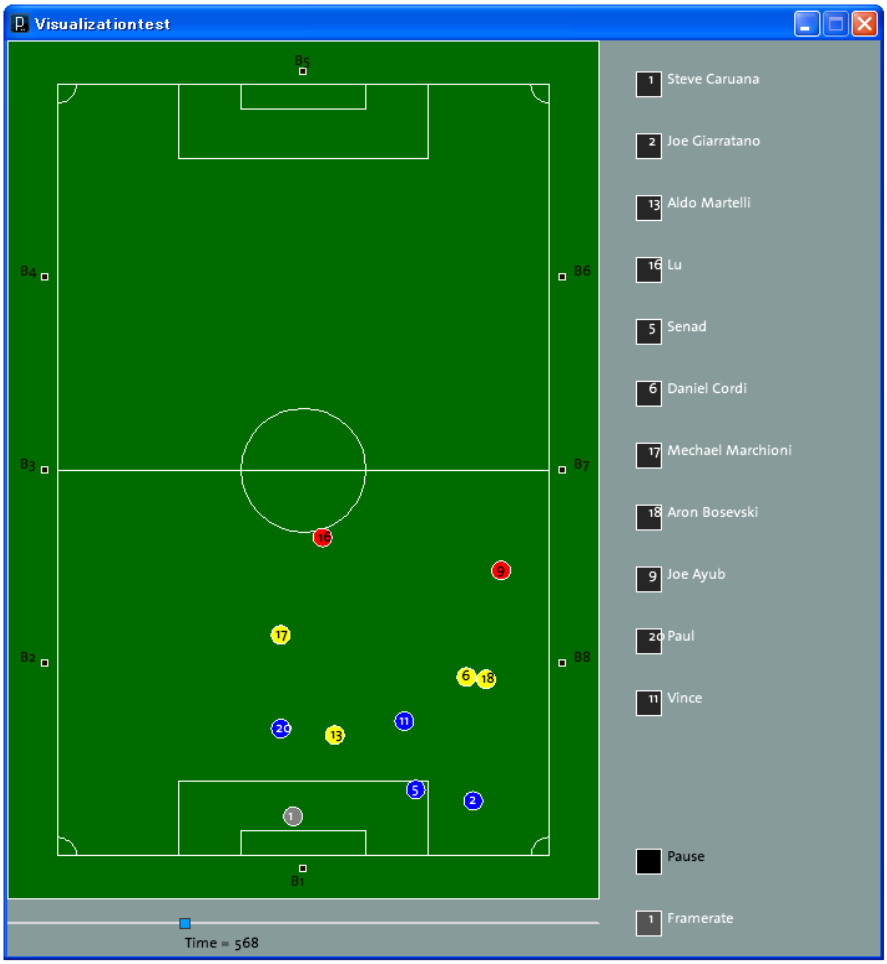

Figure 2. Screenshot of animation visualisation

Equipment to be used for Demo

- Standard Windows laptop (provided by authors)
- Large monitor (~20", preferably wide-screen) to display the 3 windows (provided by LCN organisers or hotel)
- GPS data logger and strap (provided by authors)
- Sensor mote and strap (provided by authors)
- AC power to power laptop and monitors (provided by hotel)
- Small desk to place monitor and laptop on (provided by hotel).

Demo Setup Time required

Provided that desk, power outlets and monitors are already present, setup time is estimated to be less than 10 minutes. This consists of booting the PC, connecting the monitor and launching the requisite programs.