Olsonet's AttractionsNet and Theme-parks

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1 ABSTRACT

Theme-parks embrace novel technologies for enhanced experience of their visitors. Communicating devices enabling new kinds of attractions and/or improving the existing ones have been recently of R&D interest and also a subject of massive investments in large scale commercial deployments [1].

Olsonet Communications has been involved in R&D in the areas of ad-hoc networking and reactive systems from its inception in 2001. We have amassed a portfolio of key patents related to the ad-hoc networking technology and its applications in some specific areas, theme-parks included.

In this paper, we analyze how the devices and their functionalities, real and hypothesized, destined for theme-parks, are addressed by the inventions disclosed in Olsonet's patent portfolio.

2 INTRODUCTION

We focus on the theme-park applications that employ wireless ad-hoc communication. In fact, we narrow the scope much further: we define an application, inspired by real functionality, embracing technological advancements that either are already included in existing theme-parks or, doubtlessly, will be added there very soon.

To further simplify the analysis, we focus on Disney's theme-parks and research. Our proposed application is similar to "Agent P's World Showcase Adventure" [2], with a few natural extensions and improvements added. That application is analyzed, with added citations from Disney Research papers centered on wireless communication in theme-parks and our proposed application.

Our ultimate goal is to expose the value of Olsonet's patents to theme-park owners. However tempting, digressions into a broader scope or more detailed and comprehensive analysis are left out.

3 TREP HUNT

We define a simple application inspired by existing functionality [2]. TREP stands for *Treasure Peg.*

Participants wear multipurpose wristbands, either with embedded displays or associated, e.g. via Bluetooth, with the owner's handsets, for the UI. The wristbands may serve many other purposes, similar to Magic Bands [3].

Set to the TREP HUNT mode, the band calculates a series of TREPs to visit during a game session. The calculations can be widely variable, from random selections from a rigidly predefined set, to heuristic selection based on the the player's characteristics, to explicit recipes defined by the park operators.

The TREPs can be fixed and stationary (e.g. landmarks), fixed and mobile (e.g. Disney characters), volatile (temporarily assigned to either fixed or mobile objects) or even work as tokens bestowed on the game's participants. TREPs issue beacons with their identifiers

and optional attributes. Further variations abound, e.g. an embedded accelerometer may make a TREP visible only when mobile/immobile.

The Hunters collect TREPs by proximity presence, when the RSSI from a TREP currently hunted goes above a preset threshold. Again, an array of options opens, e.g. TREPs present in a hunt session can be identified for future re-visiting. A successful TREP collection is signaled to the band wearer by a buzz. At all time, the hunt status is being displayed to the band wearer in a form suitable to the band's UI.

The distance from a TREP is always presented as a number of hops, or inverted RSSI, if the wristband is in the TREP's proximity. In addition to the wristband wearer, the game's flow unfolds on multiple large screens in the hunt area, for the participants, their families, and fans. Communication between nodes is of an ad-hoc nature, with no external infrastructure support. Depending on the hunt area and the number of participants, additional pegs may be deployed for enhanced connectivity. This independence from infrastructure enables quick setups for truly surprising, ever-changing and short-lived scenarios and locations.

This somewhat laconic, vague, and largely generic game description is aimed at the analysis to follow. Hopefully, it also underlines a vast set of options that this generic class of games can morph into in various theme-parks.

4 PATENT MAPPING / TECHNOLOGY ANALYSIS

For brevity, we only analyze the main claim of US Patent #7,113,106 “Communication nodes for use with a wireless ad-hoc communication”, mostly ignoring the relevant descriptions from the patent, and the other related patents as well. The scope is set by the TREP HUNT application described above and selected Disney Research papers; the former makes the analysis closer to a standard comparison with commercial products, while the latter ensures that we stay with the company's development path and the area's experts.

The main claim:

A monitoring node comprising:

- a processor;
- a transceiver in communication with the processor for receiving signals and for transmitting signals, the signals transmitted and received via a wireless communication medium;
- a transducer, in communication with the processor for sensing a first physical parameter and for providing a first signal, including data, relating to the first physical parameter;
- the processor for identifying a received second signal as one destined for the monitoring node and other than destined for the monitoring node, and when the identification is indicative of the second signal being destined for other than the monitoring node, relaying the received second signal via the transceiver, and when the identification is indicative of

the second signal being destined for the monitoring node, providing an indication to the receiving party of the received signal;

- the processor for generating a third signal for transmission, wherein the third signal includes at least the first signal including data relating to the first physical parameter; and
- wherein the monitoring node executes an ad-hoc communications protocol to communicate with at least one other monitoring node to form an ad-hoc network.

Monitoring node: The wristband monitors its state in the game context. It monitors its distance from currently hunted TREP, based on the inbound packets (# of hops from the TREP) and RSSI (a circuit within the transceiver). It monitors elapsed time. Optionally, it monitors the physical environment: movements or lack thereof, battery level, temperature, the last two built into the standard RF chips and operations. The TREP optionally (but most likely) monitors its neighborhood for game statistics, distance from other TREPs, number of successful wristbands, elapsed time.

A processor: Present in all involved devices, e.g. MSP430, CC430.

A transceiver: Either integrated with the processor, e.g. CC430 or a distinct chip, e.g. CC1101. Although TREPs could be equipped just with transmitters and maintain their main functionality (beacons), such suboptimal hard limits would constitute a serious design error. In any case, most of the networked devices must communicate via receiving and transmitting data.

A transducer: Circuitry for received signal strength, built into the RF chip. Optional accelerometer. Voltage sensor. The first signal is (digitized) RSS, a movement notification or the time elapsed from the last movement, digitized voltage reading.

The processor for identifying a received second signal as one destined for the monitoring node and other than destined for the monitoring node: All nodes do that, regardless whether they relay packets or not. Only packets destined for a particular node are received for further processing on this node. Note that this discerning functionality may be performed on explicit indicators (e.g. packet destination id or broadcast indicator) or implicit, based on the context functionality, e.g. only wristbands in TREP HUNT mode process beacons from TREPs.

When the identification is indicative of the second signal being destined for other than the monitoring node, relaying the received second signal via the transceiver: All nodes; wristbands, TREPs or dedicated forwarders, do that. All packets addressed to other nodes and broadcast packets are considered to be relayed, according to the employed routing protocol.

When the identification is indicative of the second signal being destined for the monitoring node, providing an indication to the receiving party of the received signal: All nodes do that, receiving party being the destination node's resource (LCD screen, LEDs, a processing trigger (e.g., to set an operational parameter), buzzer) or an attached device (e.g. Bluetooth-connected smartphone).

The processor for generating a third signal for transmission, wherein the third signal includes at least the first signal including data relating to the first physical parameter: All nodes equipped with sensors do that explicitly. RSSI above a preset threshold, voltage below another threshold, interrupt from accelerometer for movements or timeout for lack of movements for a prescribed period and many optional sensors for optional functionality, all may constitute the first signal embedded in an event notification sent to dedicated nodes to display the game progress, perform system-level monitoring (e.g. battery replacements) or be directly involved in the game logic (e.g. lack of movement may make a node invisible).

The monitoring node executes an ad-hoc communications protocol to communicate with at least one other monitoring node to form an ad-hoc network: All nodes implement the same communication protocol, for connectivity. If the network is of an ad-hoc nature, i.e. the nodes communicate without an infrastructure, with their sheer presence being the networking enabler, they form an ad-hoc network. Note that the TREP HUNT exemplifies a common feature shared by ad-hoc networking applications: **the networking itself is part of the application,** as opposed to rigid separation of a (distributed) application running on nodes, and networking playing a connectivity role, clearly separate from the application logic.

It should be noted that the *monitoring node* hardware (processor, transceiver, sensors) is ubiquitous in this application area, although components may differ signifcantly. Here is an example from [4], devised for experiments with multihopping WiFi:

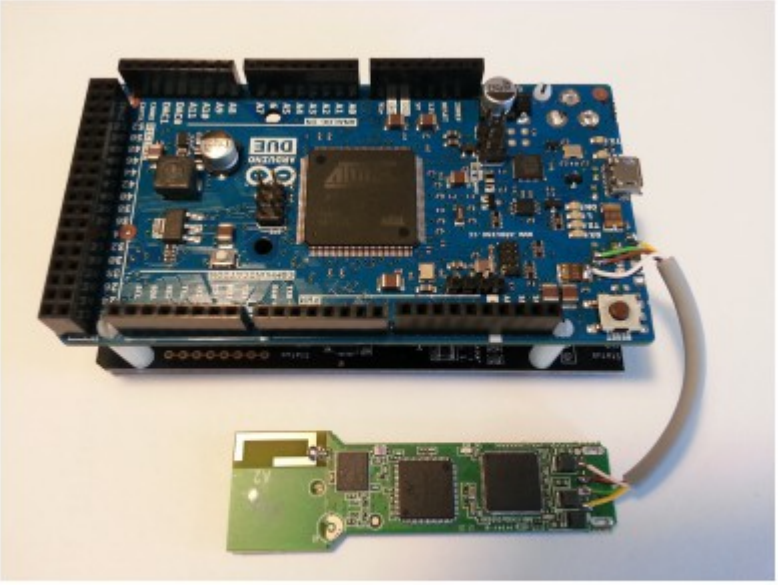

Fig. 13. Hardware platform for MH-PSM evaluation consists of an Arduino Due board and an Atheros AR9170-based Wi-Fi transceiver.

Clearly, ad-hoc networking may play a pivotal role in theme-park applications, as signaled in the ongoing works at Disney Research [4], [5]:

http://www.disneyresearch.com/wp-content/uploads/p1_ithings.pdf

"*Many objects, such as consumer electronics and toys, are becoming equipped with sensors and wireless communication capabilities. They will connect to each other locally using ad hoc networks and globally using IP infrastructure to create the Internet of Things (IoT).*"

"Ad hoc networks of wireless devices carried by theme park visitors can be used to support variety of services. In such networks, links between the devices sporadically appear and disappear with the mobility of visitors."

"Wireless sensor networks usually consist of a set of static sensor nodes and a static sink collecting data from the sensor nodes through hop-by-hop wireless communication."

5 CONCLUSIONS

Our intention was to make a case that multi-hop ad-hoc networking has found its way to theme-park deployments and will likely be employed there in various applications.

In this context, we signal that Olsonet's inventions may play a key role in such developments in this highly inventive and competitive environment.

6 REFERENCES

[1] http://www.businessweek.com/articles/2014-03-07/disney-bets-1-billion-on-technology-to-track-theme-park-visitors

[2] http://disney.wikia.com/wiki/Agent_P's_World_Showcase_Adventure

[3] https://disneyworld.disney.go.com/plan/my-disney-experience/bands-cards/

[4] http://www.disneyresearch.com/wp-content/uploads/p1_ithings.pdf

[5] http://www.disneyresearch.com/wp-content/uploads/p1-chants.pdf

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