

Applying a real-time location service to recording event attendance

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AIM

To develop an accurate, reliable and automated method for recording attendance at events.

INTRODUCTION

Gatherings such as chart rounds, peer review, seminars and resident oral exams are essential to any Radiation Therapy department. Involvement of faculty and residents improves the quality of these events, and should be encouraged. Attendance may be encouraged by direct incentive or at annual review. Recording attendance then should be accurate, efficient and not interfere with the event itself. Accrediting bodies (CAMPEP, ACR, ABR, APEX) may also need true attendance numbers.

METHOD

- An in-house real-time location system (RTLS) was previously developed (Tang G et al 2020)
- Bluetooth low energy beacons are located by Raspberry Pi receiving stations (**Figure 1**)
- Locational accuracy is enhanced by an AI algorithm
- RTLS also used to track equipment location
- Beacons were attached to the back of staff ID badges
- The department is divided up into zones, including meeting rooms (**Figure 2**)
- Real-time locations of 31 staff and 100s of equipment items are saved incrementally to a database when their location changes
- Attendance is determined by comparing staff location from the database to the meeting location and time from the online department calendar (**Figure 1c**)

RESULTS

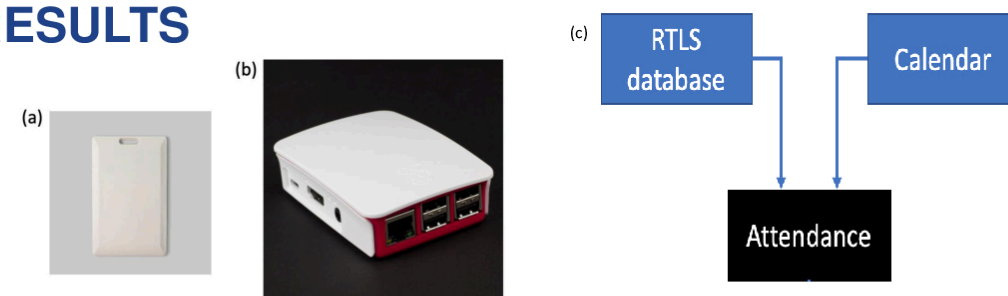


Figure 1: The heart of the Real Time Location system, (a) the Bluetooth low energy beacon (b) Raspberry Pi (c) the workflow of the system.

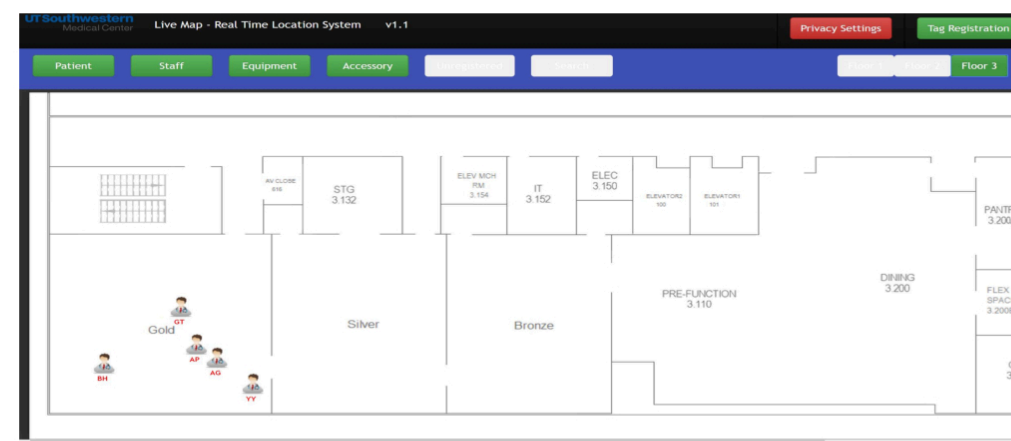


Figure 2: Third floor department map, including the Gold, Silver and Bronze meeting rooms. Physicians have begun to arrive for a seminar in gold

Figure 3 shows the web interface for the RTLS system. The interface displays a table of attendance data for various events, including Chart Rounds and Seminars. The table includes columns for Name, Attendance rate, and event details. A threshold of 50% is set for attendance. An inset shows a dispute dialog box with a fraction of 0.2 and a dispute button.

Name	Attendance rate	Chart Rounds: 2020-01-15 16:00-17:00: EC3.120 Rad Onc Conf Rm 2; EC3.130 Rad Onc Conf Rm 3	Chart Rounds: 2020-01-22 16:00-17:00: EC3.120 Rad Onc Conf Rm 2; EC3.130 Rad Onc Conf Rm 3	Chart Rounds: 2020-01-29 16:00-17:00: EC3.100A Rad Onc Conf Rm 1; EC3.130 Rad Onc Conf Rm 3	Chart Rounds: 2020-02-05 16:00-17:00: EC3.120 Rad Onc Conf Rm 2; EC3.130 Rad Onc Conf Rm 3	Chart Rounds: 2020-02-12 16:00-17:00: EC3.120 Rad Onc Conf Rm 2; EC3.130 Rad Onc Conf Rm 3	Chart Rounds: 2020-02-19 16:00-17:00: EC3.120 Rad Onc Conf Rm 2; EC3.130 Rad Onc Conf Rm 3	Chart Rounds: 2020-02-26 12:00-13:00: EC3.120 Rad Onc Conf Rm 2; EC3.130 Rad Onc Conf Rm 3
	44%	-	-	-	✓	-	✓	✓
	0%	-	-	-	-	-	-	-
	11%	-	-	-	-	-	-	-
	89%	✓	✓	✓	✓	✓	✓	✓
	0%	-	-	-	-	-	-	-
	44%	-	✓	-	✓	-	✓	-
	0%	-	-	-	-	-	-	-
	33%	✓	✓	-	-	-	-	-
	22%	✓	-	-	✓	-	-	-
	33%	-	-	✓	✓	-	✓	-
	33%	-	-	-	✓	-	-	-
	11%	-	-	-	✓	-	-	-
	22%	-	-	✓	-	-	-	✓
	56%	-	✓	✓	✓	-	✓	-
	56%	-	✓	-	✓	-	✓	-
	56%	✓	✓	✓	✓	-	-	-
	0%	-	-	-	-	-	-	-
	11%	-	-	-	-	-	✓	-
	22%	-	-	-	-	-	-	✓
	44%	-	-	-	-	-	✓	✓

Figure 3: The web interface presents searched attendance data, and summarizes individual and meeting attendance. The threshold is adjusted to set the percent of time present in the meeting room to count as attendance. Inset: When hovering the mouse, the fraction of the meeting time spent in the room is given (0.2), along with the option to dispute.

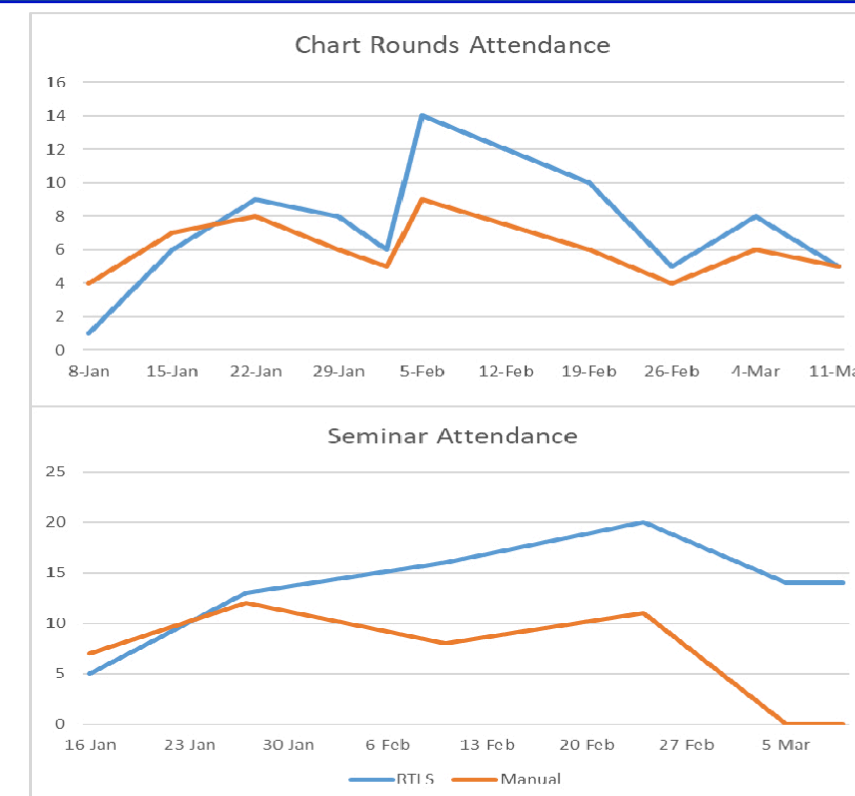


Figure 4: For two months manual (web page or QR code sign in) and RTLS attendance at Chart Rounds and Seminars were compared. The first two weeks represent assignment of beacons, after which RTLS records higher attendance than manual, as some physicists forget or later chose not to manually sign in, knowing RTLS has recorded their presence.

CONCLUSIONS

Real-time location based attendance has replaced manual recording. It has:

- ☐ Simplified the recording of attendance
- ☐ Removed delays and interruptions of events
- ☐ Improved accuracy of recorded attendance
- ☐ Accelerated review of attendance
- ☐ Received zero disputes during first two months
- ☐ Will expand to physician faculty and residents

FEATURES

- ☐ Web interface (**Figure 3**)
- ☐ Set percent of time (non-contiguous) in meeting room required to count as attending
- ☐ Administrators can sort by attendee type (e.g. faculty, resident), and event type
- ☐ Enable individuals to review their own attendance
- ☐ Allow individuals to dispute the record, and for administrators to resolve disputes
- ☐ Adaptable to changes in meeting time and venue, even if department calendar is not updated
- ☐ Does not interrupt or delay event
- ☐ Can account for people arriving late or leaving early
- ☐ Compared to manual attendance (**Figure 4**), RTLS gives a higher attendance count after its adoption

REFERENCES

Tang, G., Yan, Y., Shen, C., Jia, X., Zinn, M., Trivedi, Z., Yingling, A., Westover, K. and Jiang, S., 2020. Development of a real-time indoor location system using bluetooth low energy technology and deep learning to facilitate clinical applications. Medical Physics.

CONTACT INFORMATION

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