DEMO: A Remote Sensor Placement Device for Scalable and Precise Deployment of Sensor Networks

[1]David Mascareñas
dmascarenas@lanl.gov

[1]Logan Ott
logan@lanl.gov

[2]Aaron Curtis
aarongc@nmt.edu

[1]Sara Brambilla
sbrambilla@lanl.gov

[1]Amy Larson
amylarson@lanl.gov

[1]Steve Brumby
brumby@lanl.gov

[1]Charles Farrar
farrar@lanl.gov

ABSTRACT

The goal of this work is to develop a new autonomous capability for remotely deploying precisely located sensor nodes without damaging the sensor nodes in the process. Over the course of the last decade there has been significant interest in research to deploy sensor networks. This research is driven by the fact that the costs associated with installing sensor networks can be very high. In order to rapidly deploy sensor networks consisting of large numbers of sensor nodes, alternative techniques must be developed to place the sensor nodes in the field.

Figure 1 Prototype intelligent gas gun with magazine to hold 3 sensor packages.

To date much of the research on sensor network deployment has focused on strategies that involve the random dispersion of sensor nodes [1]. In addition other researchers have investigated deployment strategies utilizing small unmanned aerial helicopters for dropping sensor networks from the air. [2]. The problem with these strategies is that often sensor nodes need to be very precisely located for their measurements to be of any use. The reason for this could be that the sensor being used only have limited range, or need to be properly coupled to the environment which they are sensing. The problem with simply dropping sensor nodes is that for many applications it is necessary to deploy sensor nodes horizontally. In addition, to properly install many types of sensors, the sensor must assume a specific pose relative to the object being measured.

MobiSys'14, Jun 16-19 2014, Bretton Woods, NH, USA
ACM 978-1-4503-2793-0/14/06.
http://dx.doi.org/10.1145/2594368.2601481.

Figure 2. Remote sensor placement package embedded in a piece of fiber board using the remote sensor placement device.

In order to address these challenges we are currently developing a technology to remotely and rapidly deploy precisely located sensor nodes. The remote sensor placement device being developed can be described as an intelligent gas gun (Figure 1). A laser rangefinder is used to measure the distance to a specified target sensor location. This distance is then used to estimate the amount of energy required to propel the sensor node to the target location with just enough additional energy left over to ensure the sensor node is able to attach itself to the target of interest. We are currently in the process of developing attachment mechanisms for steel, wood, fiberglass (Figure 2).

In this demonstration we will perform a contained, live demo of our prototype pneumatic remote sensor placement device along with some prototype sensor attachment mechanisms we are developing.

1. REFERENCES

[1] Wan, P.J., Yi, C.W., 2006. *Coverage by Randomly Deployed Wireless Sensor Networks.* IEEE Transactions on Information Theory, Vol 52, No 6.

[2] Corke, P., Hrabar, S., Peterson, R., Rus, D., Siripalli, S., Sukhatme, G., 2004. *The Autonomous Deployment and Repair of a Sensor Network Using an Unmanned Aerial Vehicle*. Robotics and Automation, Proceedings of ICRA 2004, IEEE International Conference on, Vol 4, (New Orleans, LA, USA, April 26-May 1, 2004).

[1]Los Alamos National Laboratory, PO Box 1663, Los Alamos, NM, USA 87544

[2]New Mexico Tech, 801 Leroy Pl, Socorro, NM, USA, 87801.