Abstract:
Localization technologies have seen great success and pervasive deployment. We can classify them based on who calculates the target position. Any of the three participants in a positioning scene - target, positioning infrastructure or third party - may perform the localization: (i) In self-positioning, a target such as a smartphone calculates its own position, for example, using a GPS constellation; (ii) In infrastructure positioning, the infrastructure senses target wireless traffic and calculates the target's position. For example, cellular towers can use triangulation to locate a calling phone. (iii) In a third party wireless localization, the third party senses the received signal strength (RSS) and localizes the target without (or with) the help of the infrastructure. This type of localization has potentially broad applications in public safety, cyber forensics, network management and many other applications.

In this talk, I will introduce three systems we have developed for third party localization: (i) HAWK - a mini Helicopter-based Aerial Wireless Kit, (ii) Sr Robot - search and rescue robot, and (iii) 3DLoc2 – three dimensional localization and locking toolkit. We propose an analytical methodology that considers the effect of target traffic pattern and specific hardware parameters on localization time and accuracy. We innovatively treat a packet sniffing process as a RSS sampling process and propose new sampling theories in localization. We consider flight speed and target traffic pattern for the first study of localization time and accuracy for aerial vehicles flying a route based on a space-filling curve. These systems will fill the gap in the state of art localization for scenes where no positioning infrastructure is available.

Bio:
Dr. Xinwen Fu is an associate professor in the Department of Computer Science, University of Massachusetts Lowell. He received B.S. (1995) and M.S. (1998) in Electrical Engineering from Xi'an Jiaotong University, China and University of Science and Technology of China respectively. He obtained Ph.D. (2005) in Computer Engineering from Texas A&M University. His current research interests are in network security and privacy, digital forensics, and wireless networks. He has been publishing papers in conferences such as IEEE Symposium on Security and Privacy (S&P), ACM CCS, ACM MobiHoc, IEEE INFOCOM and IEEE ICDCS, journals such as ACM/IEEE ToN, IEEE TPDS, IEEE Transactions on Computers (TC), and IEEE Transaction on Mobile Computing (TMC), book and book chapters. He spoke at various technical security conferences including Black Hat. Dr. Fu’s students won the silver medal at the ACM Student Research Competition at ACM MobiCom 2011. His research is supported by NSF.