**A Cellular Automata (CA) Model for Target Tracking in Distributed Mobile Wireless Sensor Network (MWSN) Using Hexagonal Grid**

**Background**

A CA based tracking algorithm for MSWN was introduced in [1] by Sang-Ki Ko *et al*. They divided the entire process into 3 parts:

1. **Sensor Dispersion:** They used the COUNT algorithm developed in [2] to initially disperse all the sensors in the network.
2. **Energy Efficiency:** Next they implemented the Sensor Activation Strategy Where Active-Sleep transition was used and compare the result with Naïve, Random activation strategy. Results showed that their method was better than Naïve activation.
3. **Target Tracking:** Finally, they use the tri-level activation strategy to successfully track any target in the network.

**Proposal**

The CA model used in [1] uses a square grid for their algorithm. Our goal is to develop a similar target tracking algorithm that can be applied in hexagonal grids. We intend to achieve this goal through the following steps:

1. **Sensor Dispersion (Implemented):** In [3], a CA Motion Planning Algorithm is developed for hexagonal grids based on the algorithm introduced in [2] which uses square grid. However, [3] did not implement the COUNT algorithm which was also introduced in [2]. [3] assumed that since the Motion Planning Algorithm is better than the COUNT algorithm in square grid, it will also be better in the hexagonal grid.

We implemented the COUNT algorithm in the hexagonal grid and verified this assumption. Finally, we used the Motion Planning Algorithm to disperse the sensors in the network.

1. **Energy Efficiency:** We have implemented Sensor Activation Strategy where Sleep-Awake transition is used. This sensor activation rule is more energy-efficient than naïve activation rule since some of sensors are in the stand-by state by the rule. Furthermore, the MWSN following our activation rule still covers enough area.
2. **Target Tracking:** We will follow the target tracking method used in [1] in this step. In [1] a square grid is used to track target. We will change the algorithm can be successfully applied in hexagonal grid.

**Reference**

[1] Sang-Ki Ko, Hwee Kim and Yo-Sub Han. A CA Model for Target Tracking in Distributed Mobile Wireless Sensor Network, 13th International Conference on Control, Automations and Systems, (ICCAS), 2013.

[2] S. Choudhury, S. G. Akl, and K. Salomaa. Energy efficient cellular automaton based algorithms for mobile wireless sensor networks. In *Proceedings of the 2012 IEEE Wireless Communications and Networking Conference*, WCNC’12, pages 2341–2346, 2012.

[3] Salimur Choudhury, Sakhawat Hossen, Muhammad Mahbub Alam, Ahnaf Munir, Shihab Uzzaman. Localized Motion Planning algorithm for Mobile Wireless Sensor Networks, *Int. Journ. of Unconventional Computing*