ABSTRACT

Wireless Sensor Network (WSN) is a system consisting of one or more sensors which will capture information according to the sensor's characteristic. Each WSN node, which equipped with communication device to communicate with surrounding nodes, receive order from node head and transmit retrieved information to node head or Base Station. Sensor node commonly spread across sensor plane.

Generally, sensor node have limited processing capability and very limited energy resources. On conventional techniques, sensor nodes did data sampling according to Nyquist rate rules, even though sensor nodes commonly transmit raw data directly due to its limited ability to do compression. That will cause inefficiency on WSN network which consist of hundreds or thousands of nodes.

Compressive sensing has been applied on radars, which also have low computational capability, render CS a feasible alternative on WSN node. By using CS on WSN nodes, sensor nodes could directly retrieve a handful of measuring as a linear projection from raw data and could directly transmit CS measurements to base station without further processing in the node head.

In this research, we use a dataset of real measurements performed by Songwei Fu. In the measurements were performed, measured delivery performance package (packet loss, delay, throughput, energy consumption) via a link in a variety of configuration parameters 802.15.4 stacks for more than 6 months. We used most of the dataset to test combinations of CS and transformation algorithm is the best. In testing, we eliminated most of measurement data randomly.

From the results of the simulation, Basis Pursuit algorithm combined with Transformation of Two Dimensional Discrete Cosine Transform (2D-DCT), giving the results of MSE better / smaller than the other algorithms. In the simulation of temporal data, obtained MSE 0.0759 on removing the entry delay 10%, 0.1962 on removing the entry delay 30%, and 0.2993 at the 50% removal of entry delay. In the simulation of spatial data, obtained MSE 0.4098 on removing the entry delay 20%, 0.3651 on removing the entry delay 30%, and 0.8077 at the 40% removal of entry delay. MSE on temporal simulation provides MSE value smaller than the spatial simulation in all scenarios do. This is caused by the delay value on temporal data is smaller than the value of delay in the spatial data.

NMSE of the simulation results show that, Compressive Sensing Algorithm succeed in the reconstruction of the data delay is eliminated up to 50%, as shown by the highest value of NMSE is 9,5x10-3, which is still at the maximum value of MSE required by the data packet transmission. So, in the calculating of energy consumption, can be do reduction the number of nodes that perform measurements in order to obtain energy efficiency. The number of nodes is reduced or does not measure up to 50%.

In the temporal measurement, for efficiency / reduction of measurement of 10%, 40%, and 50% indicate the percentage of energy efficiency that is better than the spatial measurement. While the measurement of spatially, for efficiency / reduction of measurement of 20%, and 30% indicate the percentage of better energy efficiency compared to the measurement of temporally.