or *sink-node*, they have to handle traffic from all nodes in cluster which make them drain out of battery quickly. Some techniques are developed to enhance the power efficiency of node. For instance, data aggregating technique can reduce the data transfer on intermediate node but lead to high latency and inaccurate data.

Another issue of WSN is the number of required nodes needed to keep good network performance are quite huge. When deploying WSN, nodes will be setup to cover all monitoring area. At the same time, they have to keep connectivity with other nodes to exchange data. Usually, the number of required nodes to keep connectivity is larger than number of required node to keep coverage. This number can goes to thousands of nodes for keeping connectivity in comparison with hundreds of node needed for coverage.

Due to existing issues of WSN, this work proposes a new WSN system to overcome the drawbacks of WSN by using Unmanned Aerial Vehicle (UAV) to collect distributed data in combine with Bluetooth Low Energy (BLE) communication technology. New system is designed based on the idea: instead of keeping *sink-node* stationary and waiting for data by routing, we make it mobile to collect data and apply new low energy technology which was not designed for WSN to reduce power consumption.

Several solutions in combining UAV with WSN to enhance WSN performance was proposed such as using UAV to interconnect between sparse clusters located at fragmented parcels and a base station, using a cooperative connected UAVs as *sink-nodes* to collect data in clusters, using UAV as a mobile node in WSN for emergency situation, or using UAV as an addition solution for charging, deploying WSN nodes. This solution will consider using UAV in WSN (Fig.1) as a mobile *sink-node* to connect sensor network part with processing part. Also, a low - power solution developed for Wireless Personal Area Network (WPAN) is applied as a mean of communication.

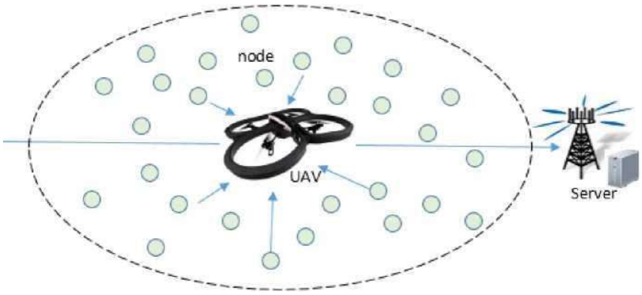

Figure 1. WSN with UAV

The proposed WSN system is designed based on single-hop data transmission approach where a UAV carries a *sink-node* and fly through monitoring area to collect data from deployed sensor nodes connected to it. Sensor nodes and *sink-node* will communicate with each other using BLE. *Sink-node* can either send a wake up signal continuously to activate sensor node to get data or scan for periodical wake up sensor nodes to establish connections and exchange data. After data collection process, UAV can come back to base station for transferring collected data to server and recharging battery. New system is designed for UAV to collect sensor data in schedule or anytime when needed. UAV also can be programmed to monitor the whole sensing area or a part of it.

There are some advantages can be pointed out from the new design. Firstly, the *sink-node* node mobile and sensor node is stationary will make sensor node consume less energy. Secondly, sensor nodes do not have to spend energy on keeping connectivity with other nodes, also energy for routing schedule is reduced. Finally, new system only needs a number of node to cover deploying network and do not have to worry about maintaining the connectivity among nodes. This will help to decrease the number of deployed nodes in monitoring area.

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СИНТЕЗ НЕЛИНЕЙНОГО ПРИЕМНИКА ЧИСЛОВЫХ КОДОВ АВТОМАТИЧЕСКОЙ ЛОКОМОТИВНОЙ СИГНАЛИЗАЦИИ

Безопасность железнодорожного транспорта в значительной степени зависит от надежной работы устройств автоматической локомотивной сигнализации (АЛСН). В настоящее время в системах АЛСН передача сигнальной информации осуществляется по индуктивному каналу связи между рельсовой линией и локомотивными катушками, что отрицательно влияет на качество приема числовых кодов за счет наличия в нем электромагнитных помех различного происхождения. Статистические свойства этих помех переменчивы, поэтому невозможно обеспечить достоверную передачу сигналов АЛСН при использовании аппаратуры обработки сигналов, параметры которой не отслеживают характеристики входных помех. В связи с этим возникает необходимость в теоретическом обоснование и синтезе структуры оптимального приемника сигналов, способного изменять параметры алгоритма их обработки в соответствии с текущей интенсивностью помех.

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