UAV based SDN system for wireless sensor networks

ABSTRACT

Abstract goes here.

1 INTRODUCTION

Introduction goes here.

2 RELATED WORK

Introduction goes here.

3 ARCHITECTURE

The architecture of the UAV based SDN system for wireless sensor networks.

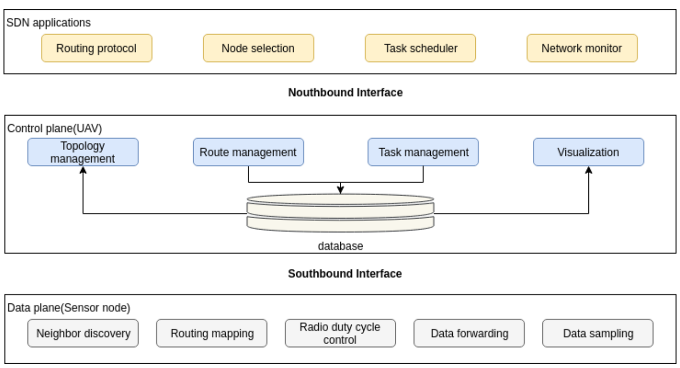

Figure 1: Architecture of the system.

Listing 1: An example of deploy routing algorithm

```
topology = get_topology();
//calculate routetable for each node
//based on topology
for(node in nodeset){
        node.routetable =
                calculate_route(topology);
}
//set route for each node
for(node in nodeset){
        UAV fly to node;
        for(route in node.routeTable)
                set_route(route);
}
```


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Table 1: System API

Function	Description
Sensor Control API	
switch_sensor(node,state)	Turn on or turn off the sensor
get_sensor_info(node)	Get sensor's information, including sensor's position, duty cycle, power, etc.
set_sensor_attr (node,attribute,value)	Set node attribute, including duty cycle, radio strength, etc.
get_neighborlist(node)	Get the neighbor list of a node
Application API	
Routing protocol	
topology get_topology()	Get the topology of the network
set_route(route)	Set the routing table
Node selection	
nodeset naive_selection(location)	Select sensor set by location information
nodeset AI_selection(dataset)	Select sensor set by AI algorithm based on sensing data
Task scheduler	
task_buffer(task)	Add a new task to task buffer
task_schedule(buffer)	Schedule the tasks in the buffer
Network monitoring and visualization	
float get_node_energy(node)	Get node energy
int get_traffic_num(node)	Get traffic number
show_network_info()	Show the network GUI

4 APPLICATIONS

Design the following applications and provide APIs to users.

4.1 Routing protocol

4.2 Node selection

Naive selection.

AI selection.

$$\begin{aligned}
&(\mathbf{W}_{k+1}, \mathbf{z}_{k+1}) = \\
&\arg\min_{\mathbf{W},\mathbf{z}} \sum_{i=1}^{k} \mu^{k-i} \|\mathbf{X}_k^i \mathbf{D}_\mathbf{z} \mathbf{W}(\mathbf{I}-\mathbf{D}_\mathbf{z}) - \mathbf{X}_k^i(\mathbf{I}-\mathbf{D}_\mathbf{z})\|_2^2 \\
&+\alpha \sum_{i,j=1}^{n} \|\mathbf{y}_i - \mathbf{y}_j\|_2 |W_{ij}| - \beta \sum_{i,j=1}^{n} \|\mathbf{y}_i - \mathbf{y}_j\|_2 z_i z_j + \lambda \|\mathbf{W}\|_F^2 \\
&s.t.\ \mathbf{z} = [z_1, \ldots, z_n] \in \{0,1\}^n, \mathbf{c}^T \mathbf{z} \le P \qquad (1)
\end{aligned}$$

Figure 2: Objective function.

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AI helps creating smarter sensor systems.

AI systems have been improving, and new advances in machine intelligence are creating seamless interactions between people and digital sensor systems.

In sensor systems, applications can be found for a variety of tasks, including selection of sensor inputs, interpreting signals, condition monitoring, fault diagnosis, machine and process control, machine design, process planning, production scheduling, and system configuring. Some examples of specific tasks undertaken by expert systems are: * Assembly * Automatic programming * Controlling intelligent complex vehicles * Planning inspection * Predicting risk of disease * Selecting tools and machining strategies * Sequence planning * Controlling plant growth.

AI can increase effective communication, reduce mistakes, minimize errors, and extend sensor life.

The tools and methods described have minimal computation complexity and can be implemented on small assembly lines, single robots, or systems with low-capability microcontrollers. These novel approaches proposed use ambient intelligence and the mixing of different AI tools in an effort to use the best of each technology. The concepts are generically applicable across many processes.

minimum energy, data loss, reliability, robustness, etc., in place during the design and operation of wireless sensor networks

a specific set of protocols for medium access, localization and positioning, time synchronization, topology control, security and routing are identified based on the current configuration of the network, the requirements of the application and the topology of their deployment.

4.3 Task scheduler

Sensors are assigned tasks to monitor a specific area.

Different tasks have different requirements, including time, density, etc.

Task scheduler do the arrangement.

Task buffer.

Task queue.

Scheduling table.

...

4.4 Network monitoring and visualization

Visualize network monitoring and monitor the network in real-time.

Make the system user-friendly(easy to use).

5 IMPLEMENTATION

Implementation goes here.

6 EVALUATION

Evaluation goes here.

7 CONCLUSION

Conclusion goes here.