

Quantum Network Communication Based on Voice-Control Technology

Xiang Yibin¹

¹ Hunan University

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Abstract

Quantum network communication based on the characteristics of quantum entanglement has been realized. However, it is still difficult to realize a multi-horizontal and multi-vertical global network system, and there are few relevant literature and reports on exploring the interrelationship between quantum systems and people and everything. This paper studies the possibility of communicating with a life body and a non-life body through a human's voice in the quantum induction network. This paper discusses the relationship between thinking consciousness and entangled quantum systems and puts forward the following point of view: the weak magnetic field generated by the quantum spin wave interacts with other quanta to generate induction waves, and then the induction waves are connected to form a quantum induction network to transmit voice-controlled information. It is proposed that the sound wave of a human can resonate with the spin wave generated by a certain quantum and be instantaneously transmitted to another quantum with an entanglement relationship with the first quantum, no matter how far they are from each other. This is to achieve the purpose of communication between humans and other life bodies, non-life bodies. A corresponding research plan is designed, taking the control of a remote device through people's voices as an example to conduct a thought experiment, and giving specific application scenarios to prove its feasibility and practicability. The analysis discusses the significance, based on the quantum entanglement effect, of the use of voice control technology to communicate and

to realize the interconnection of all things.

XIANG Yibin

College of Computer Science and Engineering, Hunan Information University, Changsha 410205, China, Email: xyibin2016@163.com, ORCID iD: [0000-0003-1937-9009](https://orcid.org/0000-0003-1937-9009)

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1. Introduction

The research of quantum mechanics involves fields such as quantum computers, quantum networks, and secure quantum encrypted communication. Quantum information is a new discipline that combines quantum physics and information technology, mainly including two fields: quantum communication and quantum computing. Quantum communication mainly researches quantum cryptography, quantum invisible transmission, the technology of long-distance quantum communication, and so on; quantum computing mainly researches quantum computers and quantum algorithms suitable for quantum computers [1]. In recent years, countries such as Europe and the United States have formulated national-level scientific, technological, and industrial strategic development plans to vigorously support the development of quantum technologies such as quantum computing and quantum communication. For the first time, China has included quantum communication research in a major scientific plan in the "National Medium- and Long-Term Science and Technology Development Plan (2006-2020)." Since the 18th National Congress of the Communist Party of China, quantum communication has received more attention from the political, industrial, and academic circles, and a series of major breakthroughs in technology research and development and applications have been achieved [2]. Quantum communication is moving from point-to-point communication applications to networked applications, including local area network and wide area network applications. A wide-area quantum communication network covering the world is also under development [3]. According to the entanglement exchange principle [4], the entanglement relationship between the transport particles can make two distant incoherent particles entangled in a similar way [5]. The ubiquitous quantum correlations in the quantum world, represented by quantum entanglement, are the basic correlations that make up the world. A single quantum can not only interact through the weak magnetic field generated by the spin, but also generate an induction field through the interaction of their respective magnetic fields due to their own entanglement characteristics, and generate an induction wave with the fluctuation of the induction field, forming a quantum induction network. Then information is transmitted through resonance to realize the communication between all things [6].

The application of voice control technology can be seen everywhere in life, such as voice-activated lights, voice systems on mobile phones, voice-to-text systems, voice-activated corridor lights, voice-activated mice, voice-activated music fountains, and voice-activated car model systems, etc. This technology can convert the vocal language issued by people

into control signals to direct the machines to work. These technologies not only facilitate our lives but also bring great convenience to the lives of severely disabled patients. For example, disabled patients can use sound to open doors and windows, TVs, electric lights, and other devices.

This project intends to use voice control technology to transmit information in quantum induction networks and interact with remote devices or people to achieve communication between people and all things. Before that, I had proposed the points in a series of related papers for the idea: of establishing a quantum induction network based on quantum entanglement technology, using the principle of frequency resonance to transmit information, and building a cosmic network of interconnected everything.

2. Quantum entanglement and thinking consciousness influence each other

Both bodies and non-life bodies in the universe are composed of microscopic particles such as atoms, electrons, and photons. The energy of the movement of substances such as atomic nuclei, electrons, and photons in the microscopic world is transmitted in the form of waves [7]. All things in the universe are interrelated based on quantum entanglement, as shown in Fig. 1.



Figure 1. All things in the universe are interconnected based on quantum entanglement

Consciousness is a fundamental property of matter; every life body has quantum effects. Over the past 30 years or so, research on the neural correlates of consciousness has resulted in enormous and extraordinary achievements [8][9]. Correlation studies based on the analysis of EEG signals have shown that different levels of consciousness have an

impact on the brain's processing of music characteristics, which provides a new model and research paradigm for exploring the relationship between music perception and consciousness [10]. The interactions between biologically important molecules in the brain can serve as the basis for the quantum metalanguage that controls human and animal behavior [11]. Quantum information theory shows that there is a distinction between the unobservable mind and the observable brain, which provides a solid physical basis for consciousness research [12]. The consciousness possessed by different life bodies varies in strength and weakness, and non-life bodies also have the most basic consciousness. In my opinion, the number of entangled quanta in an object will affect the degree of induction between objects, and it is proportional to it. In the same way, the number of entangled quanta in the human body will also affect the degree of induction between people and is in direct proportion. The fluctuations of quantum in the human body will have an impact on the vibration of the brain waves of this person and then affect the thinking consciousness of this person. The magnitude of its influence is related to and is in direct proportion to the quantity of quantum in the human body and the quantity of quantum entangled with brain waves. When quanta in the human body collide due to the action of gravity, they may be in an entangled state. A quantum pair in an entangled state may have non-local correlations with other life bodies, non-life bodies, and has an influence on the vibration of the quantum in other objects or life bodies with which it has an entanglement relationship. The magnitude of this influence is related to the number of quanta entangled with each other, the degree of entanglement, and other factors, and is proportional to the degree of mutual induction between them. The quantum fluctuations in other life bodies, non-life bodies can also affect their own thinking and consciousness. At the same time, people can change the fluctuations of quantum through autonomous thinking consciousness, thereby changing their own thoughts and emotions. It is also possible to influence the consciousness of other people through the inductive relationship between the entangled quantum and other people, thereby affecting their thoughts and emotions [13].

3. Constructing a Quantum Induction Network Based on Quantum Spin Waves

In quantum mechanics, all particles possess wave-particle duality, existing not only as physical objects but also as waves. According to quantum field theory, all elementary particles correspond to a field, and interactions between particles are realized through field-to-field interactions. There is a magnetic field that exists in the life body. A study published by the California Institute of Technology team in Eneuro on March 21, 2019, showed that not only can humans sense magnetic fields, but the brain will react strongly to changes in magnetic fields [14]. Spin is an intrinsic property possessed by particles, and its operational rules are similar to the angular momentum of classical mechanics; as a result, a magnetic field is generated. After a single quantum spin generates a weak magnetic field, it can interact with the magnetic field generated by other quantum spins, resulting in a quantum induction field. Just as the movement of electric charge changes the electric field, quantum pairs in the entangled state can change the quantum induction field, and with the fluctuation of the induction field, generate an induction wave, which can then, through the induction wave interconnection, form a quantum induction network. The latest research, published on September 1, 2021, in Nature, found that spin particles can "sense" each other at a distance equivalent to several times the distance between atoms. [15]. Research has shown that spin collective motion, namely spin waves, generated by spin interactions can be used for information

transportation and processing ^[16]. Based on this, the life body and non-life body can interact with each other at a long distance without any contact. This network system uses the spin wave generated by the entangled quantum pairs and uses the quantum induction field as the transmission medium to establish the connection relationship and transmit information. Among them, the storage of quantum spins is the most critical link in this type of network. A team of researchers at TU Delft and Element Six has successfully demonstrated a fully controllable ten-qubit spin register with quantum storage for up to one minute. Their findings, published in *Physical Review X*, could pave the way for the development of larger but controllable quantum registers ^[17].

This method is completely different from the current quantum information transmission methods. Quantum information transmission includes quantum entanglement transmission, quantum teleportation, quantum state transmission, etc. Regardless of the method used, the transmission is not classical information but quantum information carried by quantum states, which cannot be used to transmit actual matter or energy. The information transmission proposed in this article first constructs a quantum induction network through the induction waves generated by quantum entanglement, and then resonates the classical information to be transmitted with the spin waves generated by certain entangled quanta through sound waves or brain waves, and instantaneously transmits it to another quantum with an entangled relationship, in order to achieve interconnection with all things.

4. Transmitting Voice Control Signals Based on Frequency Resonance Technology

4.1. The Role of Resonance

All things are in a state of fluctuation. Brain waves generated by the human brain when thinking activities occur resonance phenomena. Similar resonance phenomena equally generally exist in other animals. For example, the transmission of brain waves between animals and the exchange of information is inseparable from resonance. Scientists believe that mammalian consciousness is associated with a variety of neural synchronization ^[18]. The frequency of large-scale neuronal firing in the human brain can be measured. When the frequency of the human brain is highly consistent with one or several frequencies of some entangled quantum pairs in the body, resonance will occur. Therefore, consciousness can affect this quantum through the fluctuation of the brain, and then affect the fluctuations of other quanta having an entanglement relationship with this quantum so that a connection relationship can be established between them. In the quantum induction network, information can be transmitted and communicated through resonance between human brain waves or sound waves and the induction waves of other life bodies, and non-life bodies, as shown in Fig. 2.

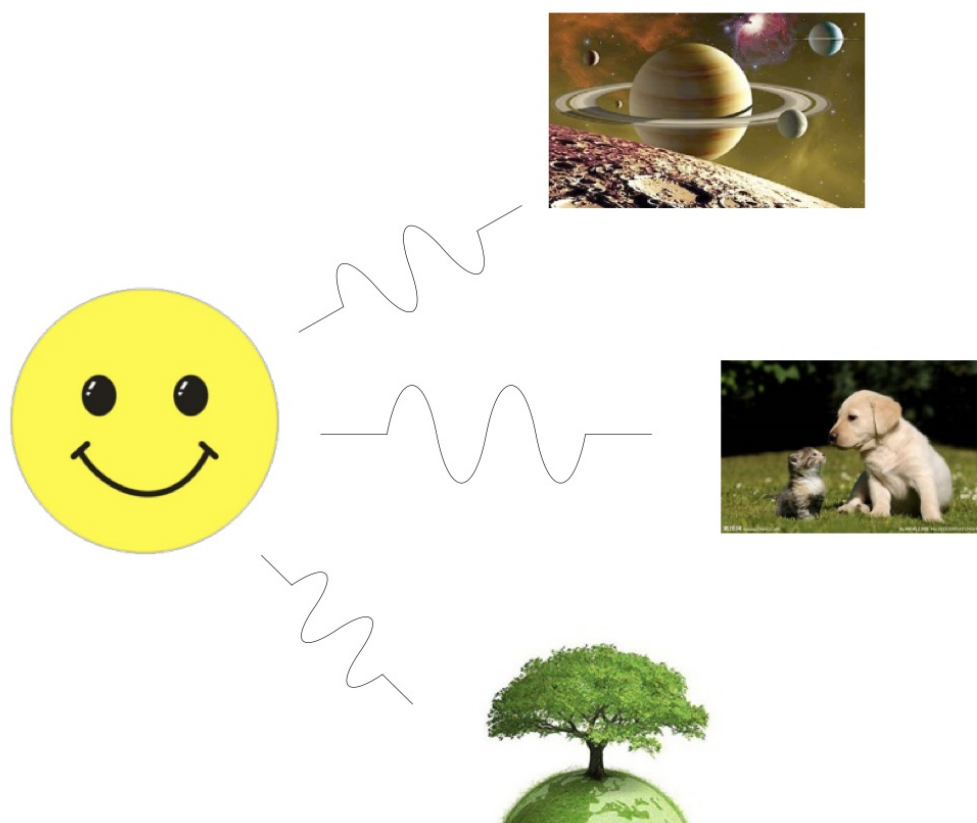


Figure 2. Human brain waves resonate with induction waves of other living and non-living bodies

4.2. Transmission of Voice Control Signals

Sound generally refers to sound waves generated by object vibration, which propagate through air or other media to the human ear or other receivers and are perceived as auditory signals. Voice specifically refers to the sound produced by human speech, which is a socially significant sound produced by the human vocal organs. [19]. The Nature sub-journal Scientific Reports reported on a new technological advancement: by monitoring brain waves, AI can restore the sound you hear and can convert brain activity into speech for playback [20]. Sound and its applications in communication have contributed significantly to shaping ecology, evolution, behavior, and ultimately the success of many animal species. Almost all communications rely on waves of some kind, and sound waves are one of the best examples [21].

In addition, people and objects can also communicate through related devices. The current sound control technology uses sound waves to transmit to the surface of a certain object to charge the material and change the sound wave to make a sound-sensitive sensor, which is coupled with a voice recognition system and some control devices to form a sound control system [22]. The latest speech recognition technology can distinguish the pronunciation of more than 92% of people, but this does not mean that the natural conversation between the user and the voice-activated electrical device can be similar to that between people.

Different from the above communication methods, in the quantum induction network, the transmission of sound is obtained by the sender by acquiring someone's language sound (sound wave). Then this sound wave resonates with the spin wave generated by a certain quantum A and transmits it to the receiver instantaneously, and a certain quantum B,

which has a quantum entanglement relationship with A, generates an induced wave. After the receiver receives the signal, it separates the sound (sound wave) and then communicates with the relevant person or thing. As shown in Figure 3.

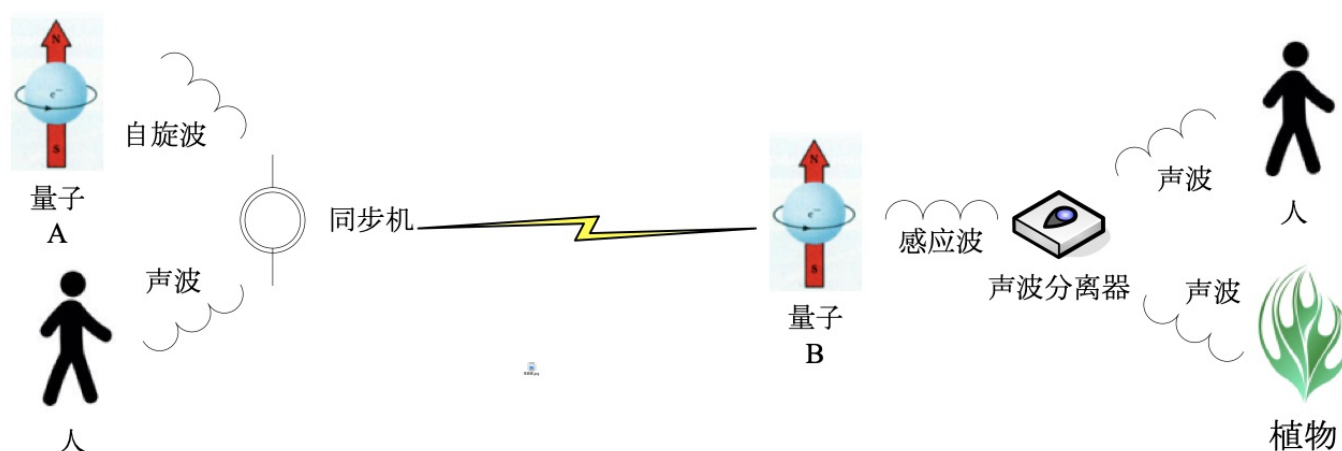


Figure 3. Transmission of voice control signals

The premise of realizing this communication is that there is at least one pair of entangled quanta between the sender and the receiver. One of them is on the sender side, and the other is on the receiver side. In this way, when one entangled quantum is perturbed to spin, the other entangled quantum can immediately sense changes in it, no matter how far apart, and can generate fluctuations, establish a connection, and complete the transmission of voice-controlled information, vice versa, to achieve the goal of two-way communication.

5. Research Scheme

5.1. Research objectives and research content

5.1.1. Research objectives

Based on the quantum entanglement effect, the significance of using voice control technology for network communication to realize the Internet of Everything is analyzed and discussed. Several schemes are designed to establish a quantum communication link through the resonance of entangled quantum spin waves and sound waves, transmit human voice and acoustic wave signals, control remote devices in the quantum link in real time, or communicate with other people, and build a quantum communication network system based on language voice control technology.

5.1.2. Research content

1. Based on the quantum entanglement effect, the significance of using voice control technology for network communication to realize the Internet of Everything is analyzed and discussed;

2. The possibility and feasibility of transmitting voice-controlled information through the interaction between the weak magnetic field generated by quantum spin waves and other quanta, generating induction waves, and then connecting them to form a quantum induction network;
3. Explore the possibility and feasibility of the sound waves generated by human voices resonating with the spin waves generated by an entangled quantum and instantly transmitting to another quantum that has an entangled relationship with that quantum;
4. Design the research plan to manipulate remote devices or communicate with others using human voices in quantum induction networks;
5. Design the research plan to verify that no matter how far the sender and receiver are from each other, the instructions can reach the receiver instantly and have an impact on the receiver. The instructions cannot be copied, cannot be tampered with, and exhibit other quantum entanglement characteristics.

5.2. Research ideas

The research of this project is divided into two parts:

Quantum-related part: First, we need to make or find entangled quantum pairs to build quantum links. Then the entangled quanta are embedded in a certain object and a certain human body, respectively, to make an association between them. And perturb the one of quantum to generate spin waves, the corresponding other quantum will also change accordingly. Thus, a correlation relationship based on quantum entanglement will be generated between these people and objects.

Voice control part: Mainly includes the acquisition and analysis of language voice control signals, how the spin wave of entangled quantum resonates with the acoustic wave, and how the acoustic wave signal of the sender is transmitted to the receiver through the quantum link, how the receiver separates the spin wave of entangled quantum from the acoustic wave, and how the receiver transmits the sound wave to the target object to make it change accordingly.

The main problems to be solved are: the acquisition of entangled quantum pairs, the resonance of entangled quantum spin waves with sound waves, the transmission of sound wave signals, and the impact of sound wave signals on remote devices or people.

The key technologies that need to be broken through include:

1. Make or find entangled quantum pairs and construct quantum links.
2. The spin wave generated by entangled quantum resonates with the sound wave generated by human voice.
3. Real-time manipulation of remote devices or communication with others in quantum links through human sound.

5.3. Experimental basis

5.3.1. Measurement of Matter-wave related parameters

The French physicist De Broglie proposed a hypothesis which points out that all microscopic particles have wave-particle duality, and any matter can fluctuate.

1. Formula for calculating the wavelength of matter wave

The de Broglie formula shows that the moving particles with mass m and velocity v have fluctuation, which satisfies the following relations:

$$\lambda = \frac{c^2}{\frac{mc^2}{h}} = \frac{h}{mv} = \frac{h}{p}$$

◦ Where: λ : wavelength; c : speed of light; v : speed; m : mass; h : Planck constant; p : momentum.

2. Matter-wave frequency calculation formula

The frequency of a single photon can be expressed as: $f = \epsilon / h = v / \lambda = 1 / T$

Where: f : frequency; ϵ : energy; h : Planck constant; v : speed; λ : wavelength; T : period.

3. Matter-wave phase velocity calculation formula

$$V_p = f\lambda = \omega / K = \omega / (2\pi)$$

Where: V_p : phase velocity; f : frequency; λ : wavelength; ω : angular frequency; K : wave vector

- By designing the experimental scheme, the phase velocity, wavelength, frequency, and other parameters of the entangled quantum pair can be measured.

5.3.2. Particle spin angular momentum calculation

Each particle has a unique spin. The spin angular momentum of a particle follows the general law of angular momentum, and the spin angular momentum is an observable measurement of the system.

$$p = [J(J+1)]h$$

Where: p is the spin angular momentum quantum number; $J = 0 \ 1 \ 2 \ 1 \ 3/2 \ \dots$

5.3.3. Measurement of sound wave related parameters

Sound waves are a form of sound propagation, and sound waves travel in all directions with the help of various media.

1. Calculation formula of wavelength of sound wave

$$\lambda = v/f$$

where: λ is the wavelength, v is the speed of the wave, and f is the frequency.

2. Calculation formula of sound intensity

$$W = U^2 R_a$$

Where: W is the sound power, U is the volume velocity of the fluid, and R_a is the radiation resistance of the sound

source.

3. Calculation formula of sound propagation speed

The propagation speed of sound in different media is different.

$$V = \sqrt{P/D}$$

Where: V is the velocity of the acoustic wave in the gas, P is the gas pressure, and D is the gas density.

- By designing the experimental scheme, we can measure the wavelength, frequency, sound intensity, and other parameters of someone's voice.

5.3.4. EEG signal feature extraction

Electroencephalogram (EEG) is a method of recording brain activity using electrophysiological indicators. It records the changes in electrical waves during brain activity and is the overall reflection of brain nerve cells' electrophysiological activity on the surface of the cerebral cortex or scalp [23]. EEG signals are usually divided by frequency. Its frequency variation range is between 1-30Hz per second, which can be divided into four bands, namely delta waves: the frequency range is 0.5-4Hz. Theta waves: The frequency range is 4-8 Hz. Alpha waves: The frequency range is 8-13 Hz. Beta waves: The frequency range is 13-30Hz. Gamma waves: Frequency range is 30-50Hz [24].

Various waves can be obtained in different regions of the cerebral cortex. The commonly used algorithms for feature extraction of EEG signals include common spatial pattern (CSP), wavelet transform (DWT), power spectral density (PSD), AR model, etc. This project intends to use the wavelet transform algorithm for research.

Discretized wavelet transform [25]: $WT_x(a_0^j, ka_0^j b_0)$, $WT_x(j, k)$

$$c_{j,k}^{\text{def}} = WT_x(j, k) = \int x(t) \psi_{j,k}^*(t) dt \quad j=0,1,2,\dots; k \in Z$$

Where: C_j, k is discrete wavelet transform coefficients, referred to as wavelet coefficients for short.

In actual work, the most common situation is to take $a_0=2$ and $b_0=1$. At this time, the value of a is 20, 21, which is the most common. At this time, the basis function $\psi_{ab}(t)$ in the continuous wavelet transform is denoted $\psi_{jk}(t)$.

$$\psi_{jk}(t) = 2^{-\frac{j}{2}} \psi\left(2^{-j}t - k\right)$$

Correspondingly, the discrete wavelet transform can be represented as

$$WT_x(j, k) = \int x(t) \psi_{jk}^*(t) dt$$

5.4. Selection of Quantum Communication Materials

Quantum is a collective term for fundamental particles such as photons, electrons, and neutrinos, all of which possess quantum states and can be used for storing, transmitting, and processing quantum information. Therefore, theoretically,

they can all be used for quantum communication.

At present, the basic particles used for quantum communication mainly include photons, electrons, and ions. These particles can be prepared into quantum states and transported, enabling applications such as information transmission and encryption in quantum communication. Among them, photons are one of the most commonly used fundamental particles and have been applied in many fields such as quantum network communication. Physicists Alain Aspect, John F. Clauser, and Anton Zeilinger have jointly won the 2022 Nobel Prize in Physics in recognition of their "breaking the limitations of Bell's inequality and pioneering the field of quantum information research through a series of experiments on photon entanglement." The Chinese Academy of Sciences at the University of Science and Technology of China has made significant progress in the study of molecular quantum entanglement, which enables molecules to convert quantum information between quantum bits at different frequencies to achieve hybrid quantum systems [26], and there have also been significant breakthroughs in communication based on neutrinos.

Neutrinos are one of the most fundamental particles that make up nature. Not charged, extremely small in mass, with a spin of $1/2$, very light in mass, moving at a speed close to the speed of light, with very weak interactions with other substances. This allows neutrinos to penetrate the Earth's crust, ocean, and ionosphere, achieving communication that ignores medium obstacles. Moreover, the coherence length of neutrinos is very long, with good directionality and no attenuation during propagation, making them the preferred material for ultra-long distance secure communication. Neutrinos are one of the most fundamental particles that make up nature. Not charged, extremely small in mass, with a spin of $1/2$, very light in mass, moving at a speed close to the speed of light, with very weak interactions with other substances. This allows neutrinos to penetrate the Earth's crust, ocean, and ionosphere, achieving communication that ignores medium obstacles. Moreover, the coherence length of neutrinos is very long, with good directionality and no attenuation during propagation, making them the preferred material for ultra-long distance secure communication. In November 2012, American scientists used neutrino beams to transmit information, which could directly pass through Earth or other planets, achieving the first communication using neutrinos [27]. In another study, scientists observed for the first time quantum entanglement between different particles, including entanglement between mixed neutrinos [28]. However, most of the neutrinos on Earth come from nuclear fusion activities inside the Sun, so it is still difficult to obtain a neutrino beam with high beam intensity and energy using simple methods, as well as how to effectively control and set fire to it.

Photons have good controllability and stability, and fast transmission speed. Photons also have a very high number of quantum bits, which can carry more information. The use of photons for quantum communication can achieve high-speed and ultra-secure communication. Although photon communication also has problems such as limited transmission distance and low transmission efficiency, this project intends to use photons as the basic material for communication for related research.

5.5 Case Study

Remote control of a device by people's voice.

5.5.1 Experimental Procedure

1. Embed the entangled quantum pair A and B into the human body P and the device T, respectively.
2. T is an active/passive smart device in which there is an automatic sound receiving/playing device.
3. Disturb the quantum A and measure the frequency at which A spins fluctuate at this time (phase speed, wavelength, angular frequency, and other parameters).
4. P issues an order, and then we measure the frequency of this sound wave and other parameters.
5. Make this sound wave resonate with the wave generated by the spin of A at this time.
6. Observe quantum B, observe whether it changes, and measure its waveform, frequency, and other parameters.
7. Separate the sound wave in the device T and restore it to the sound of P.
8. Observe the device T to see if it can perform relevant operations according to the instructions of P.

5.5.2. Application Scenarios

For example, Xiao Li ordered a certain camera 80000 kilometers away to rotate, so that it could monitor the scene situation at any time, as shown in Fig. 4.

1. There are entangled quantum pairs A and B between Xiao Li and the camera. Among them, quantum A is embedded in Xiao Li's body, and quantum B is embedded in the camera.
2. Xiao Li ordered the camera to rotate to the left. At this time, the quantum A in his body was disturbed, and the spin wave of A was resonated with Xiao Li's sound wave. Although it was far away, quantum B immediately sensed the change in A's spin, generating spin waves, and establishing a communication link with Quantum A. Xiao Li's sound waves were then transmitted to the camera.
3. The sound wave separator in the camera separates Xiao Li's sound wave and restores it to Xiao Li's voice, and controls the camera to turn to the left.

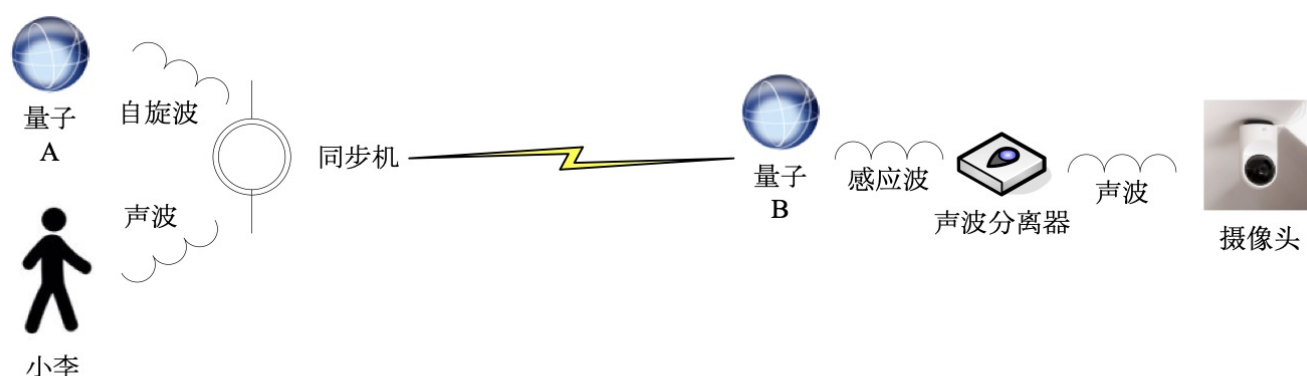


图 4 人远距控制摄像头转动

Figure 4. The person remotely controls the camera rotation

6. Summaries

The emergence of new technologies, new applications, and new models such as cloud computing, mobile Internet, Internet of Things, and big data has put forward new requirements for network information security. Network and information security involves national security and social stability. Compared with traditional communication technology, quantum communication has the advantages of strong anti-interference ability, transmission ability, high transmission efficiency, large capacity, and fast speed, and theoretically can transmit an unlimited amount of information. In 2020, the US government proposed a plan to build a quantum Internet; China is also accelerating the construction of a quantum communication system. In January 2021, the University of Science and Technology of China announced the successful establishment of a quantum communication network spanning 4,600 kilometers. China's quantum secure communication industry is at the forefront of the world in the planning and construction of quantum secure communication networks and satellite quantum communication ^[29]. The use of voice-controlled technology to transmit information on the network has been realized in computer networks, communication networks, the Internet of Things, and even quantum networks. However, human beings have never directly communicated with other life forms, non-life forms, from a long distance through sound. The main characteristic of this communication mode is that, based on the quantum entanglement property, no matter how far apart the communication parties are, there is no need for intermediate equipment in the traditional network to facilitate transfer. But in the form of a wireless network, through a quantum-induced wave as a transmission medium for communication. And there is no need to worry about information being monitored and tampered with. It has very important practical significance and practical value.

Statements and Declarations

Ethical Statement

This research project strictly adheres to the ethical standards and relevant laws and regulations of academic research. We solemnly declare that this study is currently in the thought experiment stage and does not involve specific experiments involving humans and animals.

The collection, analysis, and reporting of research data will strictly follow scientific methods and academic norms to ensure the authenticity, accuracy, and reliability of the data.

We will actively respond to and address any ethical issues or doubts related to the research.

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Availability of Data and Materials

This statement is not related to the content submitted by me and is not applicable.

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