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Research Article

Employing RFID for an Equipment Management System via Wireless Sensor Network

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This paper is mainly in combination with RFID to construct a set of power system equipment remote control, used first on the reader tags received after the use of Visual Basic in order to determine the signal and then transmits the signal via the RS232 cable to control circuit 8051 to control the instrument power switch. The topic is written in the Visual Basic RFID and uses features, such as personnel control systems, and access control systems, which are derived from the time of access control systems, several instrument control systems, and uses records stored in the form of functions, where the other circuit transmits signals to Visual Basic 8051, and then, by 8051, controls the instrument power switch.

1. Introduction

The Executive Yuan Industrial Technology Strategy Conference 2005 (SRB) focused on issues for Taiwan in RFID (Radio frequency identification) in order to develop strategies; without portfolio Lin and Feng-Ching said that Taiwan should actively participate in international standards, build a complete ecological chain of industrial developments, and build a center for production of RFID. According to US ABI Research Inc. research estimates, the annual RFID growth rate of the market was 36.5% in 2008, when it reached a three billion dollar scale. In 2010, driven by its applications, it will accelerate its growth in 2013 and is expected to reach 210 billion dollars. The RFID technology is enormous and is expected to be rapidly applied to recreational opportunities and other aspects of life [1]. People often forget to power off laboratory instruments or use damaged equipment found at the laboratory and are unable to identify the human user to ascertain the reasons for the damage, thus, combining RFID technology can solve the above problem [2].

2. Related Literature Survey

Radio frequency identification uses radio frequency communication realization contact, less action recognition technology [3]. RFID is an emerging recognition technology, which is combined with a chip, antenna, tag, receivers (read/writer), and application interfaces; the back-end system middleware (RFID Middleware) label has a small size, large capacity, and long life and is reusable and can support fast reading and writing, with nonvisible identification, mobile identification, multitarget recognition, positioning, and long-term follow-up management. Tag chips can store a wide range of information, such as by product, location, and dates. The volume can be very small, can be included in the dialectical entity, and can be noncontact and rapid and can contain large amounts of read and write data in its contents (see Table 1) [4].

RFID is radio frequency, which includes the use of low frequency (125–135 KHz), high frequency (13.56 MHz), ultrahigh frequency (UHF, such as 860–930 MHz), and microwave (2.45 GHz), depending on the frequency of the derived characteristics and different uses of different types, high frequency (13.56 MHz), and UHF (860–930 MHz). RFID has a read range of about 3 feet and 10 to 20 feet, and current RFID technology can read faster at greater distance ranges; the ground is bound to high frequency (HF) to ultrahigh frequency (UHF) applications for more than a trend (see Table 2 and Figures 2(a) and 2(b))[5].

Visual Basic (VB) was developed by Microsoft to help in environments development, including an event-driven programming language. It is derived from the BASIC programming language. Visual Basic has a graphical user interface

Table 1: RFID, barcode chip cards, and more general data.

Band	RFID TAG	Chip	Barcode
Intermediary	Electromagnetic	Electricity	Light
Data characteristics	Fixed/variable	Variable	Fixed
Reestablishment	Noncontact	Contact	Afresh
Visible	Unnecessary	Essential	Essential
Tag minimum size	0.4 × 0.4 mm	1 × 1 cm	1 × 3 cm
Tag situation	various size	Square	India to goods
Surface damage	Not affected	Not affected reading	Data corruption
Durability	Resistant to chemical attack	Things can be close to the magnetic	Not antifouling
Read distance	0~100 m	Contact	Maximum 12 m
Write	0~100 m	Contact	Not rewritten

Table 2: RFID TAG type.

Band	LF	HF	UHF		Microwave
Frequenecy	125~133 KHz	13.56 MHz	433 MHz	860~960 MHz	2.45~5.8 GHz
Nomal	ISO18000-2	ISO18000-3	ISO18000-7	ISO18000-6	ISO18000-4/-5
Aerial	Coil	Coil	Bipolar	Bipolar	Bipolar/polariztion diversity
Distance	<50 m	>50 m	50~100 m	~3.5~6 m (P) ~100 m (A)	~1 m (P) ~100 m (A)
Feature	Environmental Chaused caused almost no performance degradation	For short range and multitag identification applications	Identify long distance, time tracking of the container, the impact of environmentally sensitive high priced, multitag recognition distance, and outstanding performance impact environmentally sensitive water	High priced, multitag identification distance, and outstanding performance	Impact environmentally sensitive water
Battery	No	No	Yes	No/Yes	Yes
Recognition rate	Low	Low	Middle	Height	Middle

(GUI) and rapid application development (RAD) system, which easily uses DAO, RDO, and ADO database connections or creates ActiveX controls. Therefore, as designers focus on the program as the main body of the process, it is not possible to use traditional Basic programs, thus, shortening the programming time [6].

The Visual Basic program is a form-based visual component of joint arrangements and adds code to the specified set of attributes and methods. As default properties and methods have been defined in the component part, designers must write less code to complete a simple program. Programs can contain one or more forms or a main form and multiple subforms, similar to an operating system.

3. Hardware Description

In this study, the system employed a passive reader to receive information, it is from Microprogram Information Co., Ltd. Products,(type:MP-602MUS-3). In the lower circuit of the power supply module, the main supplies 5DCV and 110ACV to the upper circuit contain the signal receiver modules and Visual Basic 8051 instrument power control module of the analog control equipment load (Figures 3(a)–3(c)).

Radio frequency identification (RFID) is used to handle individual passenger information in this study, which passengers' status is shown in car company owing to information system of many members. Lacking the capability to express them, the aged and those suffering from mental illness require clear identification. Only after identifying the patients can this embedded biosignal evaluator be activated when the pulse, electrocardiogram, or blood oxygen concentration is randomly measured by medical staff or when it is self-measured. One RFID tag is buckled onto each patient with the patient's basic data inside. When conducting a test, the tag is passed through a read/writer unit to verify the patient identity, which ensures correctness and protects personal information without risking misplacing the data [7].

The RFID working principles are as shown in Figure 1; wherein, the major components are the tag, reader, and computer. The tag stores data; the reader reads the data from the tag or vice versa; the reader also transfers the collected data to the computer, which processes the data using different application programs to assist users for proper strategy judgment. When sensing an RF wave from the reader, the tag, as shown in Figure 1, will generate an "alternative magnetic field," activating the builtin RF transmitter and

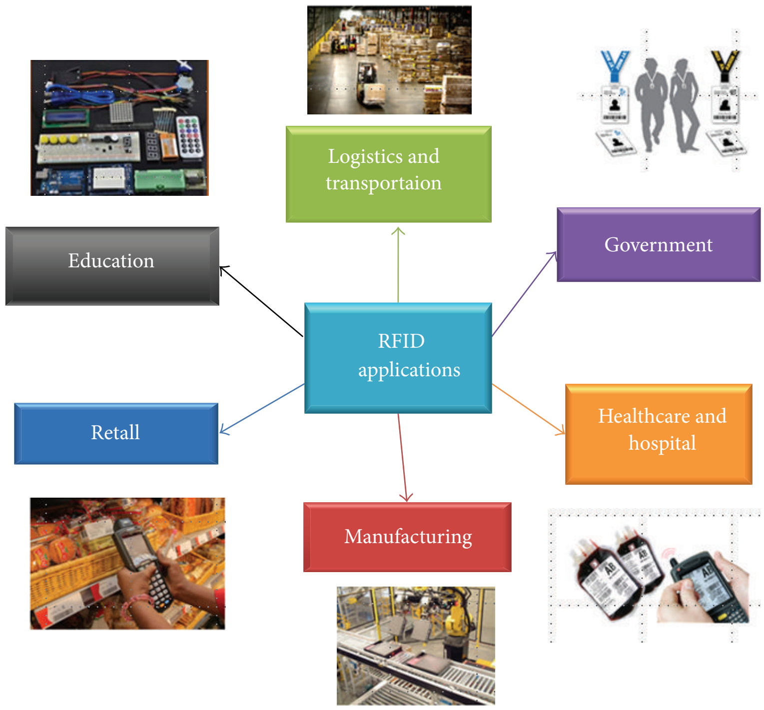
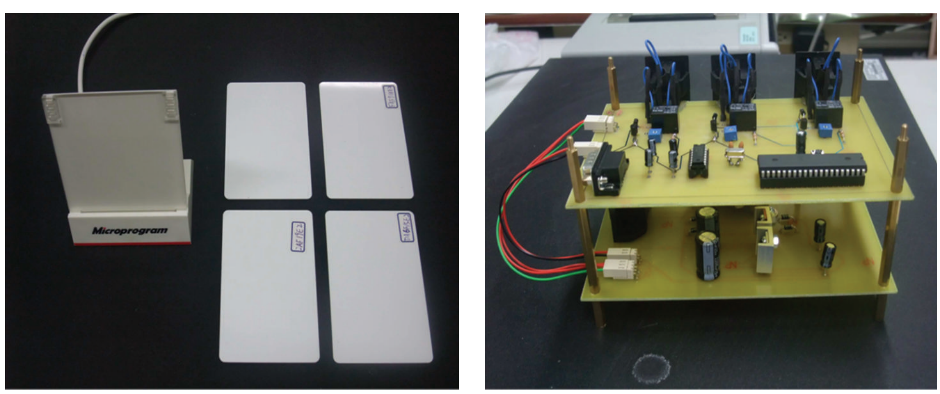


Figure 1: RFID applications.



(a) (b)

Figure 2: (a) Reader and TAG (b) 8051 instrument power supply and power control structure.

(a) (b) (c)

Figure 3: (a) Control equipment (1) (b) control equipment (2) (c) control equipment (3).

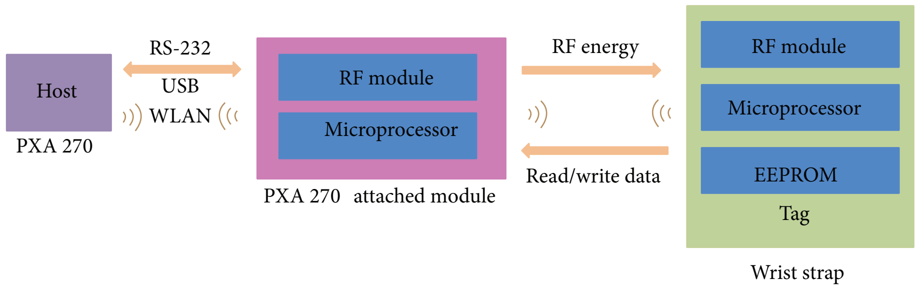


Figure 4: RFID used for identifying individuals in the care of in this research.

microprocessor to return the data inside the EEPROM to the reader. The reader will then transfer the data to the host via RS-232, USB, or WLAN interface [8].

This system is mainly initiated by RFID, in which the tag chip on the wrist band of the monitored individuals communicates with the PXA 270 platform. Attaching RFID chips on the wrists of different people can store related personal data to know whose biosignals are measured in the process, which is particularly necessary for the aged or those suffering from mental illness who cannot express themselves well. With synchronous video transmission, current appearances and reactions of individuals can be monitored in case of urgent treatment by medical staff. The embedded and portable design of this system can accommodate transport inconvenience of the aged or the physically handicapped and transfer measured signals to the monitoring server for further investigation through a wireless network (Figure 4) [9].

4. Zigbee Wireless Sensors Network Establishment

The sensing unit has two inner parts. The sensor detects surroundings and renders the received data in analog form. The ADC converts the detected analog signals into digital counterparts and sends the data to the next unit for data processing. This study builds a sensor capable of detecting smoke, IR, and temperature, as well as real-time call and biosignal sensing. The processing unit has two inner parts. The storage part stores collected environmental information as does the hard disk or other storage devices of personal computers; while the processor, similar to the CPU of personal computers, executes presaved programs to control different inside component units and coordinate the inbetween data flows. Either presaved codes or presaved commands from the rear-end server can instruct the processing unit to initiate environmental information collection by the sensing unit and return the collected and assembled data via the transceiver unit. The processing unit consists of a PIC18F4620 microcontroller and a CC2420 wireless transmission chip (Figure 5).

The transceiver unit is responsible for communication among the sensors and for transmitting the sensor data to a wireless data collector. The transmission media can be infrared, radio, Bluetooth, and so forth, in order to adapt to different surroundings or applications. The embedded PXA 270 is the transceiver unit, which is used as the main node gathering sensor signals and transmitting them to the network server in the monitoring center. The power unit is a crucial component for maintaining sensor function-operability, as it offers electric power to all inside units. Sensors are often powered by batteries, and power-saving is a major issue in hardware and software design.

In addition to the above four basic units, new functional units can be added according to different environments and applications, for example, a location finding system (LFS) to locate the sensor itself, an exterior or builtin power supply, or a mobilizer able to carry sensor data, which renders the sensor movable. Though many possible units exist inside the sensor, the most important hardware design principle is to be compact, lightweight, low cost, and highly efficient. This research uses the FPGA module to process biosignals in the kernel. In addition to the PXA270-compatible ACEX1 K50 FPGA driver and circuits, the Huahen Company also provides resources, such as RFID, Bluetooth transmission, and video.

In general, the RFID reader can only communicate with a tag, which creates the problem of signal collision. Signal collision of RFID tag signals can be divided into collision and the collision of two categories of the reader signal; the former refers to a reader with multiple labels that simultaneously receive the returned signal, resulting in inaccurate interpretation or misuse; the latter is the same A tag reader at the same time receiving more than one order, resulting in conflict. Signal collision is a very difficult issue as it causes signal transmission failure, loss, or even signal formation of wrong interpretation of data errors, and so forth, which hinders the formation of recognition. In recent years, many methods have been developed that can be used to solve the collision signal, generally referred to as anticollision. Tag anticollision for the RFID system is a significant issue for rapid tag identification. This paper presents a novel fast tag anticollision algorithm, called a DJ (Detection and Jump) algorithm. The proposed new algorithm highly improves tag reading efficiency, as compared to traditional methods (Figure 6) [10].

The DJ algorithm splits the tag identification procedure into two steps: (i) collision detection and (ii) jump reading.

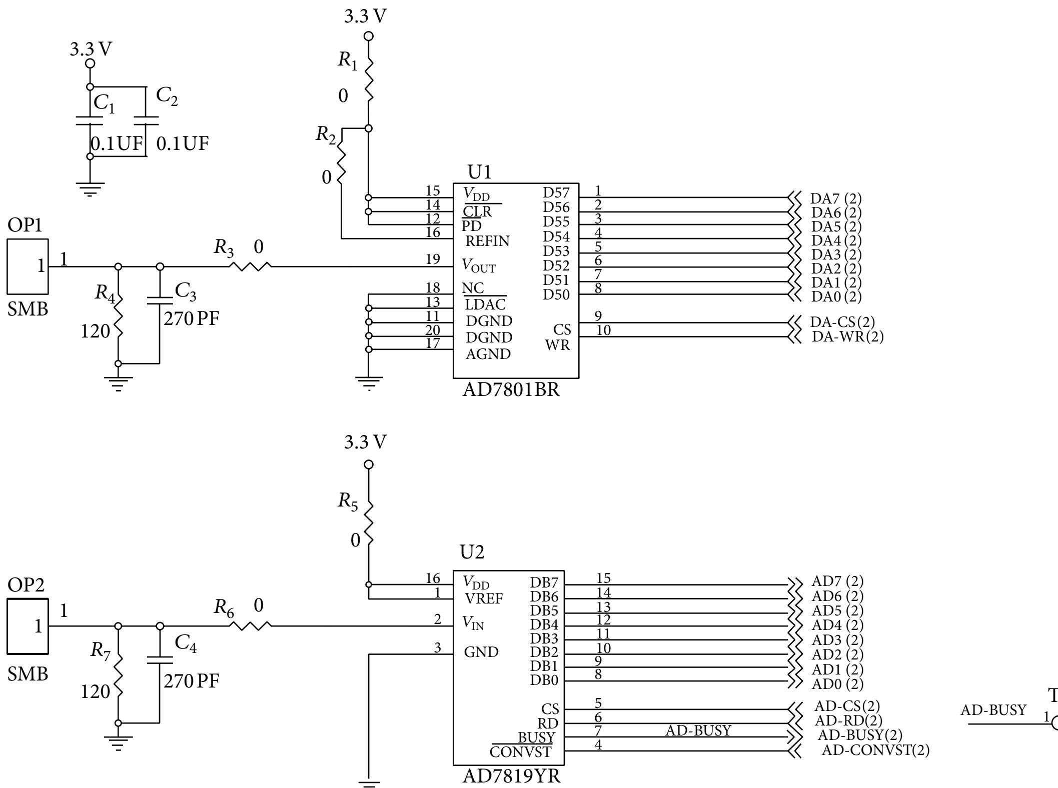


Figure 5: Hardware schematics and related original software from Huahen-provided FPGA module.

In the collision detection-step, a short collision detection frame is used to detect a tag collision. During the jump reading step, those tags that have selected a noncolliding slot are notified to respond by sending their ID information to the reader according to the detected collision information. Those tags selecting colliding slots remain to be identified in the next reading round, as based on the collision information detected in the first step [11].

Suppose that there are totally Tag_n tags to be identified and the number of collision detection slots is Tag_c; the probability that δ tags exists in a single collision detection slot follows the binomial distribution:

$$D_\delta = \begin{bmatrix} \mathrm{Tag}_n \\ \delta \end{bmatrix} \left[\frac{1}{\mathrm{Tag}_c}\right]^{\delta} \left[1 - \frac{1}{\mathrm{Tag}_c}\right]^{\mathrm{Tag}_n - \delta}, \tag{1}$$

when $q = 1$, D_1 is the probability of a successful ID transmission. Therefore, the expected number of "correct slot" S_c is given as follows:

$$\begin{gathered} S_c = \mathrm{Tag}_c \times D_1 = \mathrm{Tag}_c \cdot \mathrm{Tag}_n \left[\frac{1}{\mathrm{Tag}_c}\right] \left[1 - \frac{1}{\mathrm{Tag}_c}\right]^{\mathrm{Tag}_n - 1}, \\ \mathrm{Efficient} = \frac{M \times S_c}{M \times S_c + W \times \mathrm{Tag}_c}. \end{gathered} \tag{2}$$

Will (2) into (1) is available as following (3)

$$\mathrm{Efficient} = \frac{\left[\dfrac{M}{W\mathrm{Tag}_c}\right] \mathrm{Tag}_n \left[1 - \dfrac{1}{\mathrm{Tag}_c}\right]^{\mathrm{Tag}_n - 1}}{1 + \left[\dfrac{M}{W\mathrm{Tag}_c}\right] \mathrm{Tag}_n \left[1 - \dfrac{1}{\mathrm{Tag}_c}\right]^{\mathrm{Tag}_n - 1}}. \tag{3}$$

The definition of z as following (4)

$$z = \left[\frac{M}{W\mathrm{Tag}_c}\right] \mathrm{Tag}_n \left[1 - \frac{1}{\mathrm{Tag}_c}\right]^{\mathrm{Tag}_n - 1}. \tag{4}$$

The definition of

$$k = \frac{M}{W}. \tag{5}$$

In order to maximize Efficient, we have to maximize z. It is obvious that a bigger k produces a bigger z. In another words, a shorter *SCDF* results in a better performance, while the length of the reading slot is fixed. Tag_c remains unchanged in card slot k, where the greater the length, the higher the efficiency of the system; the larger the reader slot of Tag_c, k constant, the higher the efficiency of the system.

5. Laboratory Monitoring System Instrument

When the user employed the tag to send messages via the card with the RS232 cable connection, the Visual Basic sends

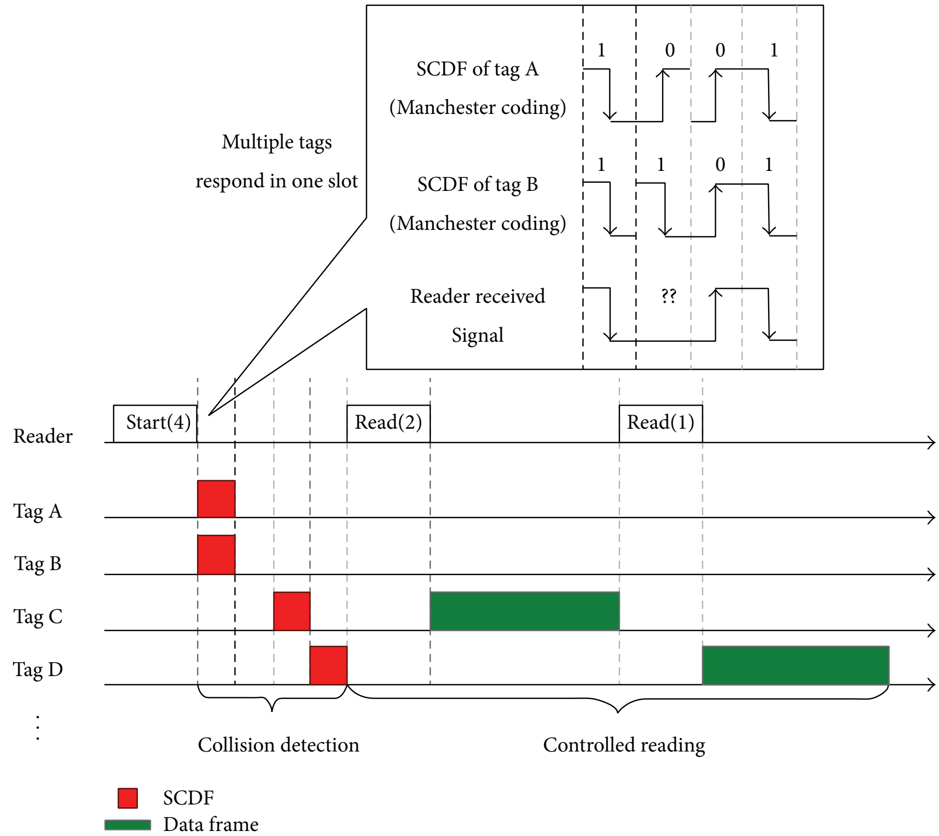


Figure 6: Detection and Jump Algorithm.

the signal of the instrument power transmitted through the MAX232 to carry out the conversion after 8051, which will receive the signal in the corresponding PORT pin and send a signal to the transistor switch to turn the transistor. The transistor turns on 5DCV, which will be added to the Relay leaving the excitation, which often opens normally closed switches, and will be added to the normally open switch 110 ACV which will turn leaving the load energized; the action will return after the 8051 signal is turned back to Visual Basic (Figure 7) [12].

If more cards by the time (or time of access to reach), Visual Basic will launch off the signal to 8051, and 8051 will be fired again to signal the transistor to switch off; then as Relay is not excited, it often will jump back to the original closed state leaving 110 ACV not normally open state power, resulting in load power; much the same way the action will return after the 8051 closed signal back Visual Basic (Figures 8(a) and 8(b)).

System Interface features include reader switches, time control, identifying of the card holder, card set permissions, meter power control, and used record storage [13].

Figure 9 shows the RFID Visual Basic interface that controls the equipment. The picture at the top of the basic control application is set as the reader's com port, access code, bound rate, and delay; then set the permissions portion of the card number in the first column by writing the required card number to use the tag card number, and then write your column in the driver permission to use several instruments. At the next start and end times, fill in the time period required, and time record table of a valid part of the tag card will show the time and card number and the state apparatus, and it will also save these records in a folder inside the convenient form search for used records.

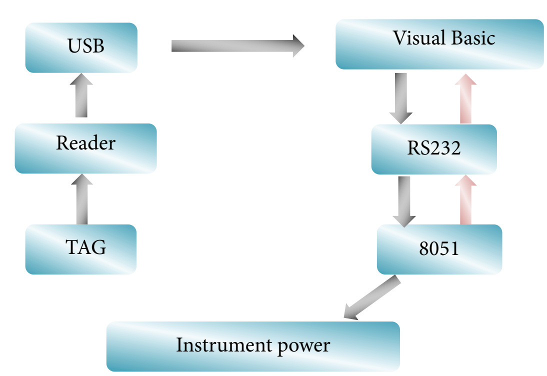
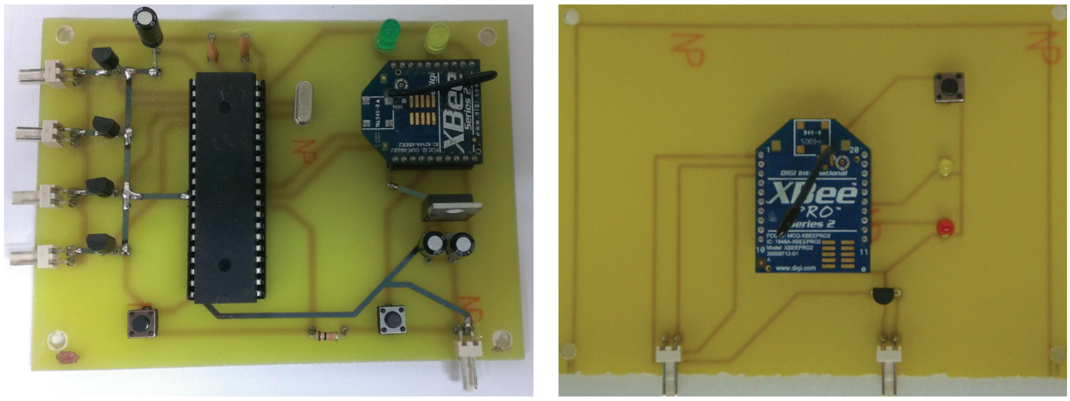


Figure 7: System flowchart.



(a) (b)

Figure 8: (a) 8051 instrument power supply control circuit (b) transistor relay switch circuit.

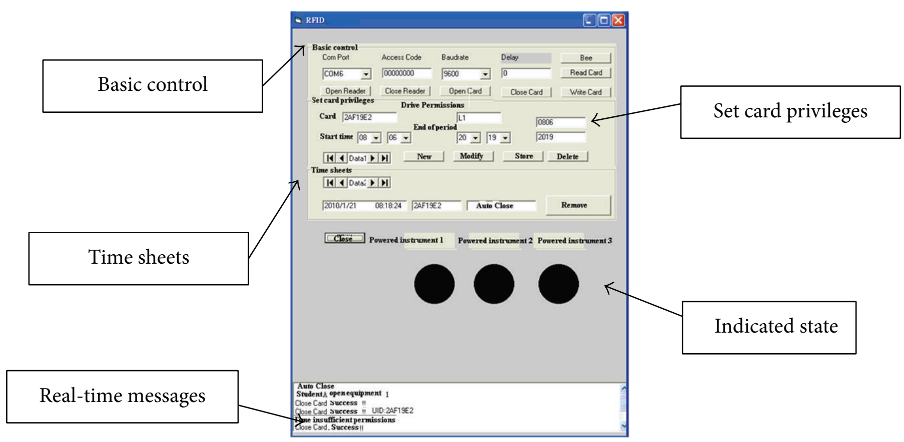


Figure 9: RFID instrument control system interface.

6. Consistency Data Fusion Algorithm

According to sung and Hsu [14], the method of multisensor measurement data consistency fusion, first of all, the definition of confidence distance measurement, which is a kind of measurement that balances the support level of odometer measurement data, is established between confidence distance matrix and relation matrix in basic structure of the multiodometer measurement data. By utilizing digraph method, a plenty of inaccuracies or errors can be deleted or removed. Finally, this paper adopts the maximum likelihood estimation (MLE) to make the best fusion value via multi-sensors measurement data.

When this study employed multisensor to measure the same parametric, this investigation can assume that third sensors (i, j, k) are measurable values (S_i, S_j, S_k) which are following the Gaussion distribution. Each pdf curve line from measurable value is used to make characteristic function (C_i, C_j, C_k). We record the first measurable values (S_i, S_j, S_k) to be s_i, s_j, s_k. To make the deviations among s_i, s_j, and s_k, we adopt conception of confidence distance measurement as follows [15]:

$$cd_{ijk} = 2\int_{s_i}^{s} C_i(s \mid s_i)\, ds = 2\alpha,$$

$$cd_{jik} = 2\int_{s_j}^{s} C_j(s \mid s_j)\, ds = 2\beta,$$

$$cd_{kij} = 2\int_{s_k}^{s} C_k(s \mid s_k)\, ds = 2\gamma,$$

$$C_i(s \mid s_i) = \frac{1}{\sqrt{2\pi\lambda_i}} \exp\left[-\frac{1}{2}\left(\frac{s - s_i}{\lambda_i}\right)^2\right],$$

$$C_j(s \mid s_j) = \frac{1}{\sqrt{2\pi\lambda_i}} \exp\left[-\frac{1}{2}\left(\frac{s - s_j}{\lambda_j}\right)^2\right],$$

$$C_k(s \mid s_i) = \frac{1}{\sqrt{2\pi\lambda_k}} \exp\left[-\frac{1}{2}\left(\frac{s - s_k}{\lambda_k}\right)^2\right]. \tag{6}$$

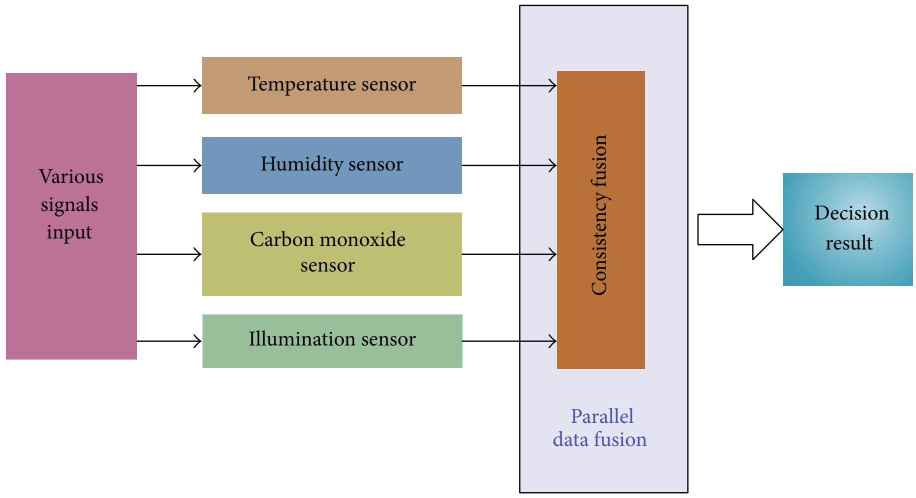


FIGURE 10: Consistency fusion method-based parallel data fusion processing flow.

The confidence distance measurement from sensors (i, j, k) is called $(cd_{ijk}, cd_{jik}, cd_{kij})$, both reflect measurement values with consistency. The value from confidence distance is lower, observation from both get similar; otherwise, the deviation gets higher. Therefore, the fusion from both sensors is called cd_{ijk}, cd_{jik}, and cd_{kij}. The α, β, γ are probability density curve square measures $C_i(s \mid s_i)$ $C_j(s \mid s_j)$ $C_k(s \mid s_k)$ on internal (s_i, s_j, s_k). Consider

$$\begin{aligned} &\text{When } s_i = s_j = s_k, \text{ then } cd_{ijk} = cd_{jik} = cd_{kij} = 0, \\ &\text{When } s_i \neq s_j \neq s_k, \text{ then } cd_{ijk} = cd_{jik} = cd_{kij} = 1. \end{aligned} \tag{7}$$

If the (w) sensor measured the same parameter, then confidence distance measurement cd_{ijk} $(i, j, k = 1, 2, 3, \ldots, w)$ established the matrix of $MScd_w$, called multisensor data confidence distance matrix which describes each sensor support level with consistency [16].

Data combination sensor is the best fusion data, which is used to make a result from measured parameters. We adopt one data from all fusion values which is probability density function being as follows in equation (8) and Maximum Likelihood function in function (9):

$$C_i(s_i \mid \delta) = \frac{1}{\sqrt{2\pi}\lambda_i} \exp\left[-\frac{1}{2}\left(\frac{s_i - \delta}{\lambda_i}\right)^2\right]; \quad vi = 1, 2, 3, \ldots, z, \tag{8}$$

$$Z(s_1, s_2, \ldots, s_z; \delta) = \prod_{i=z}^{z} C_i(s_i \mid \delta), \tag{9}$$

this investigation can get the best fusion value form original measurement data $\hat{\delta} = \delta(s_1, s_2, \ldots, x_z)$ which should satisfy the following equation:

$$Z(s_1, s_2, \ldots, x_Z; \delta) = \sup_{\delta \in \Theta} Z(s_1, s_2, \ldots, s_z; \delta). \tag{10}$$

According to (10), we can get natural logarithms for both sides; then the equation (10) is as follows:

$$\ln Z(s_1, s_2, \ldots, x_Z; \delta) = \sup_{\delta \in \Theta} \ln Z(s_1, s_2, \ldots, s_z; \delta). \tag{11}$$

According to the purpose of the maximum likelihood estimation, we can get $(\partial/\partial\delta)Z(s_1, s_2, \ldots, s_z; \delta)|_{\delta=\hat{\delta}} = 0$ which is equal to

$$\frac{\partial}{\partial\delta} \sum_{i=1}^{z} \ln \frac{1}{\sqrt{2\pi}\lambda_i} \exp\left[-\frac{1}{2}\left(\frac{s_i - \delta}{\lambda_i}\right)^2\right]_{\delta=\hat{\delta}} = 0; \tag{12}$$

this investigation got the solution as follows:

$$\text{Best}DF = \hat{\delta} = \frac{\sum_{i=1}^{z}(s_i/\lambda_i)}{\sum_{i=1}^{z}(1/\lambda_i)}. \tag{13}$$

BestDF is fusion set $\{s_1, s_2, \ldots, s_z\}$ which is the best fusion data [17].

In this study, we employed parallel framework to process various sensors data fusion for recognition and classification. Each flow possesses a consistency fusion method unit and sensor device, as shown in Figure 10. Depending on the sensor network topology, it may be more useful to implement the distributed detection or estimation using a tree structure. Referring to existing related literature, Alhakem and Varshney studied a distributed detection system with feedback and memory. That is, each sensor not only uses its present input and the previous feedback decision from the fusion center, but also uses its own previous inputs. In our IME system, we propose a real-time feedback method for approaching the multisource data fusion rule in global optimal decision conditions. Tsitsiklis shows that the optimal decision rules are still in the form of threshold tests. Tai et al. considered the case where the local decisions made at a number of sensors are communicated to multiple root nodes for data fusion [18–21].

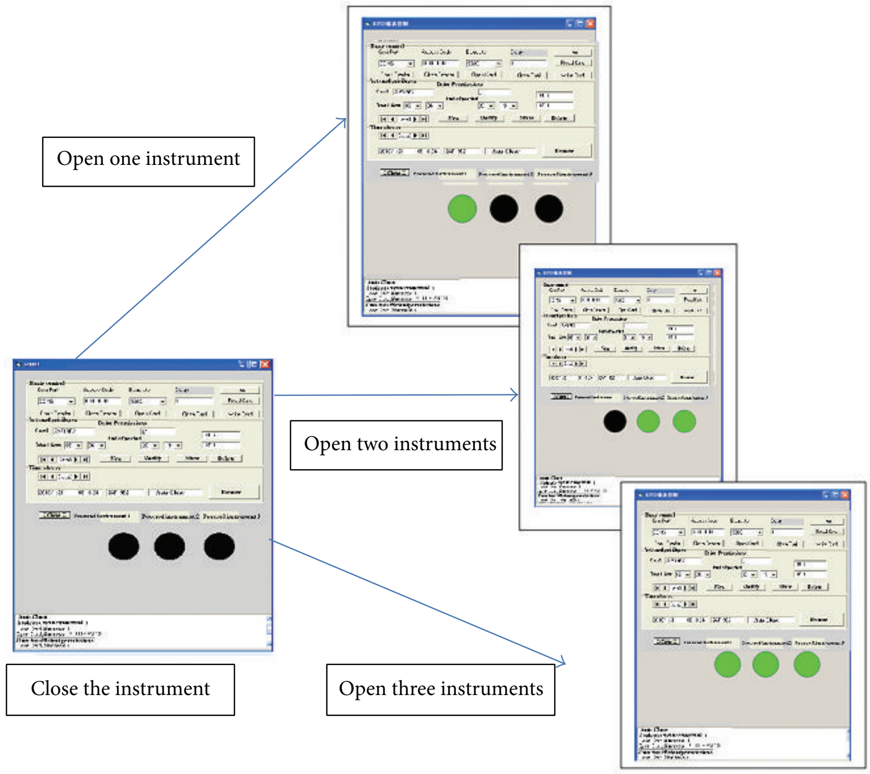


FIGURE 11: System alerts and operation.

We examine two particular sensor networks applications in the context of IME system in this paper [22]:

(1) using consistency fusion method to assist the optimal use of temperature, humidity, carbon monoxide, and Illumination in four variable measurements for IME system,

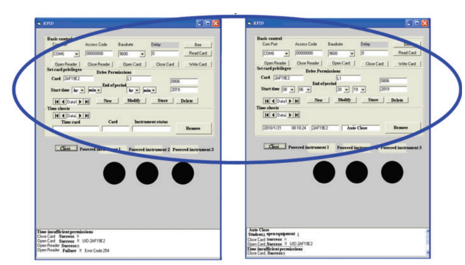
(2) using optimum fusion rule algorithms to identify and classify the parallel data fusion system.

The fusion rule is a logical function with N binary inputs and one binary output, the number of fusion rules is 2^{2^N}. The possible fusion rules for two binary decisions based on consistency fusion method training process.

7. System Experiment Results

The Figure 11 shows the use of permission tag information, which shows the interface card number, time of access, time card, and user name and states the power apparatus. If the instrument has power, it will show a green pattern, the opposite is a black state.

Figure 12(a) explains the driving privileges; even though they have the equipment, they are not set at this time tag, and without the competence to use, the instrument will not turn on, and the picture shows time insufficient privileges. Figure 12(b) shows the apparatus in use, thus, these tags have time permission and the instrument will automatically power off and be displayed in the interface. The success of each of read RFID tag instrument on or off, the system will automatically help you save the form in the specified folder, rendering it easy to use this instrument to search records. The experimental results of sensor data fusion and implement standards are as shown in Figure 12(c) and Figure 13. This investigation offers suggestions from the analysis figure, with a curve to delete or remove extreme values or values



(a) (b)

Time card	No.	Event
2010/1/21 PM 08:07:23	DA6F15E2	StudentB close equipment 23
2010/1/21 PM 08:07:24	DA6F15E2	StudentB open equipment 23
2010/1/21 PM 08:07:27	2AF19E2	StudentA open equipment 1
2010/1/21 PM 08:07:29	2AF19E2	StudentA close equipment 1
2010/1/21 PM 08:07:38	2AF19E2	StudentA open equipment 1
2010/1/21 PM 08:07:39	2AF19E2	StudentA close equipment 1
2010/1/21 PM 08:07:41	DA6F15E2	StudentB close equipment 23
2010/1/21 PM 08:07:42	DA6F15E2	StudentB open equipment 23
2010/1/21 PM 08:07:44	DA6F15E2	StudentB close equipment 23
2010/1/21 PM 08:07:45	2AF19E2	StudentA open equipment 1
2010/1/21 PM 08:07:46	2AF19E2	StudentA close equipment 1
2010/1/21 PM 08:07:49	DA6F15E2	StudentB open equipment 23

(c)

FIGURE 12: (a) Time insufficient permissions (b) authority over time automatically turning off equipment (c) instrument time record forms.

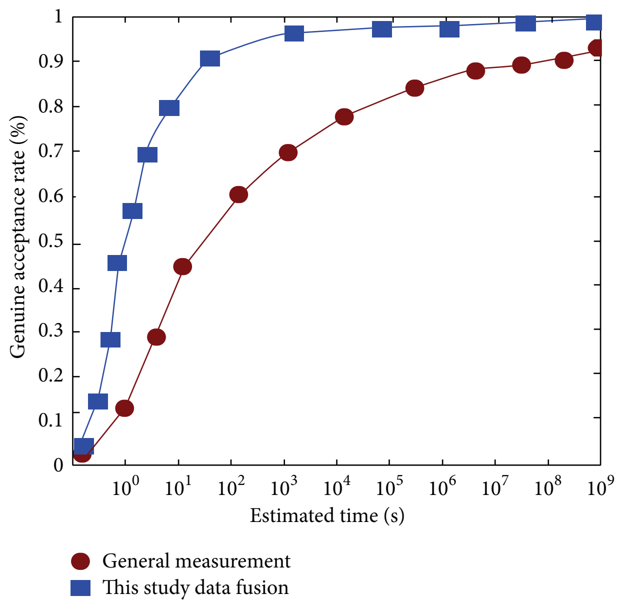


Figure 13: Results of traditional data fusion methods, compared with innovative optimization data fusion approaches.

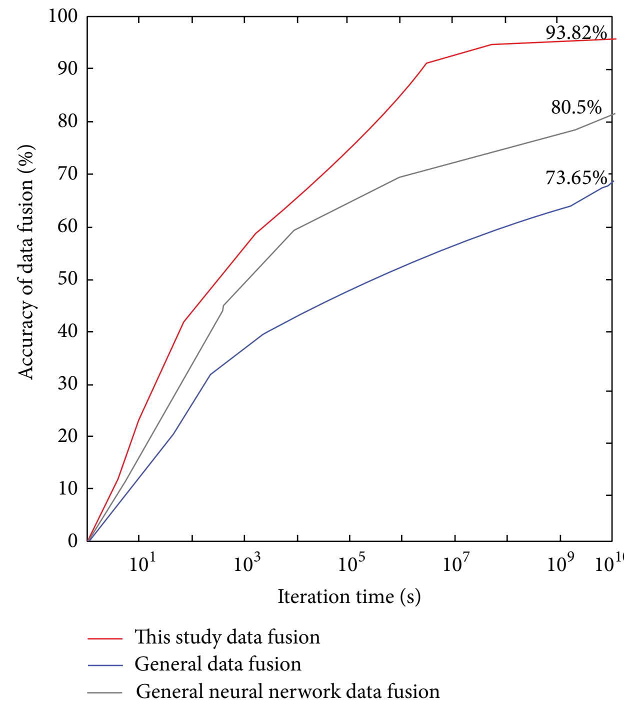


Figure 14: A comparison result of the relative acceptance rate versus the estimated time between theoretical approaches and experiment.

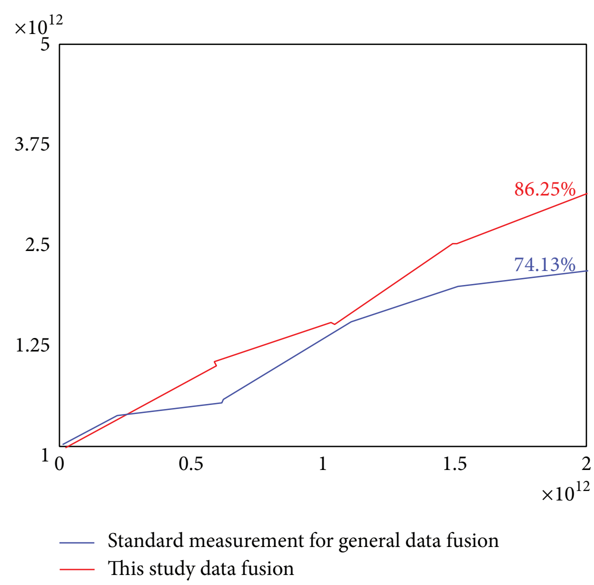


Figure 15: Graphical comparison of computational complexity for the various data fusion methods.

with errors; thus, this investigation can adapt a maximum likelihood algorithm with confidence data to render our research more accurate. However, to measure the data, the results of the data fusion algorithm are better than an average fusion algorithm.

In Figure 13, when the estimated time approaches 10^9 sec above the actual value, the measurement value tends to match. This experiment compared optimization data fusion based approaches and standard measurement and general data fusion methods, as based on parallel data fusion methods. The standard measurement based cites literature from our pervious researches in [23]. According to the training error curves, the optimization data fusion approach was better than the other general methods in measurement processes.

In Figure 14, as the estimated time approaches 10^{10} s, the acceptance rate tends to match toward the end of an observation period among the measurement, referenced from a piece of our prior work [24] and two theoretical approaches, that is, an optimization-based data fusion approach and a standard parallel data fusion approach.

Figure 15 illustrates the results from the computational complexity derivations for the various data fusion. The consistency data fusion algorithm approach shows the expected 12% reduction over the general data fusion. It is also very evident that this study has excellent computational complexity efficiency between the general data fusion and standard multirate data fusion implementation measurement.

8. Conclusions and Future Perspective

This feature, combined with Visual Basic RFID, allows the control of multiple instruments, where personnel access control and time functions are composed of modules. The topic can also be controlled by the load on other occasions, and the use of electricity controls the apparatus and makes changes, such as a motor with factory, household appliances, energy classroom, meeting places, and energy. For future additions of network monitoring, individuals can use computers in remote locations with mobile internet to achieve monitoring capabilities.

Conflict of Interests

The authors declare that there is no conflict of interest regarding the publication of this paper.

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