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IMAGE: OBSERVATORY WITH STAR TRAILS ON MOUNTAINS FOR CLEAR SKY

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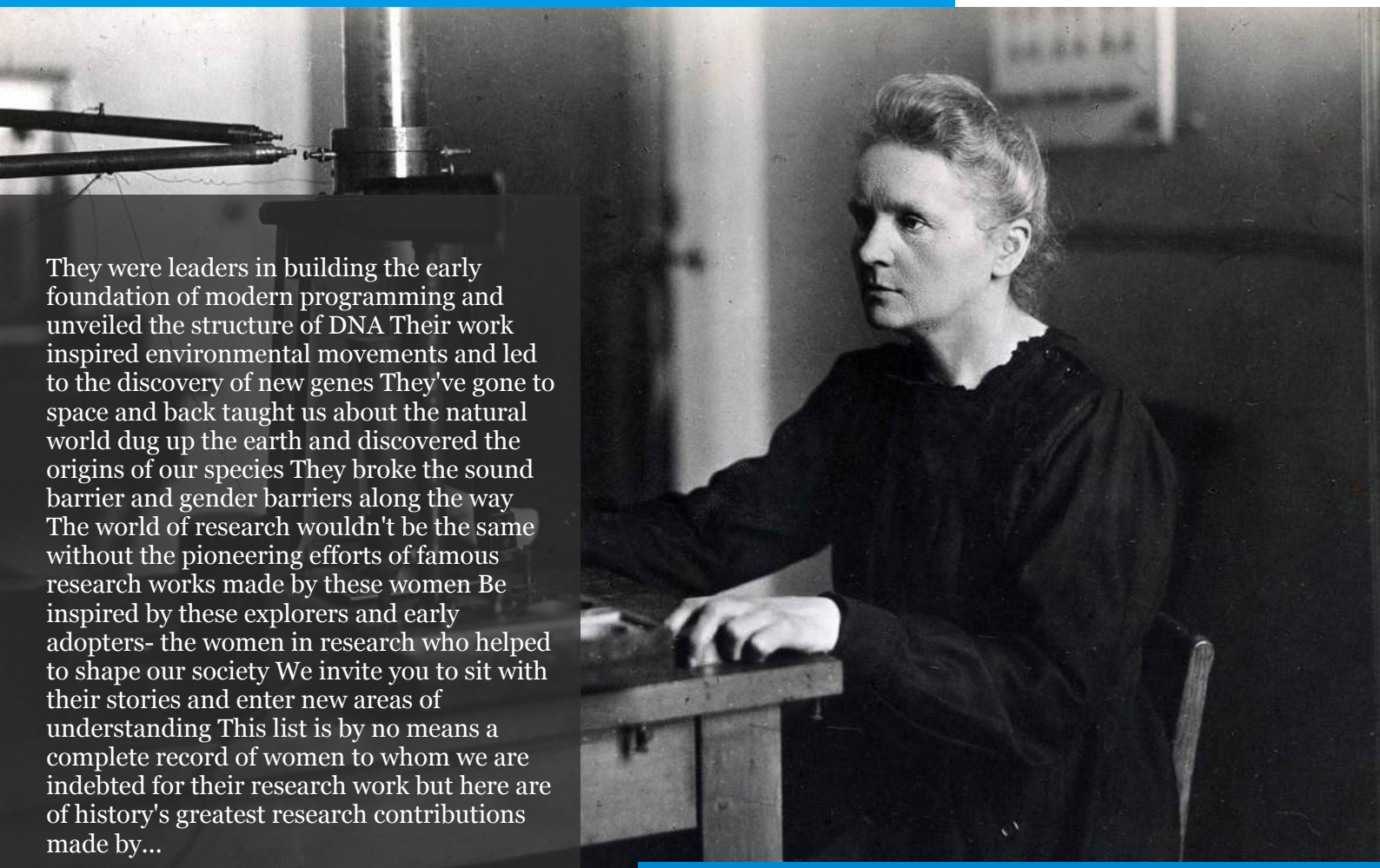

They were leaders in building the early foundation of modern programming and unveiled the structure of DNA Their work inspired environmental movements and led to the discovery of new genes They've gone to space and back taught us about the natural world dug up the earth and discovered the origins of our species They broke the sound barrier and gender barriers along the way The world of research wouldn't be the same without the pioneering efforts of famous research works made by these women Be inspired by these explorers and early adopters- the women in research who helped to shape our society We invite you to sit with their stories and enter new areas of understanding This list is by no means a complete record of women to whom we are indebted for their research work but here are of history's greatest research contributions made by...

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Towards Sustainable Agriculture Management: IoT-Enabled Greenhouse Monitoring and Regulation System for Year-Round Crop Cultivation

Mensah Sitti, Ehigiator Egho-Promise, Nivash Thirunavukarasu & Jesse Adjei-Asare

University Centre Oxford

ABSTRACT

The research focuses on the adaptation of greenhouses for farming, emphasising its positive feedback as a feasible and sustainable option for year-round crop cultivation. The research involves a system that utilises sensors connected to a microcontroller to monitor greenhouse conditions. The sensors measure temperature, humidity, soil moisture, light intensity, and water levels. The system is powered by AC to DC supply, with additional features like a fan to cool the environment and a bulb responding to natural light intensity. The collected data is sent to a webpage for remote monitoring through the Serial Peripheral Interface Flash File System (SPIFFS). The study encompasses two main aspects: sensing and regulation, and transmitting real-time data for remote monitoring.

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ABSTRACT

The research focuses on the adaptation of greenhouses for farming, emphasising its positive feedback as a feasible and sustainable option for year-round crop cultivation. The research involves a system that utilises sensors connected to a microcontroller to monitor greenhouse conditions. The sensors measure temperature, humidity, soil moisture, light intensity, and water levels. The system is powered by AC to DC supply, with additional features like a fan to cool the environment and a bulb responding to natural light intensity. The collected data is sent to a webpage for remote monitoring through the Serial Peripheral Interface Flash File System (SPIFFS). The study encompasses two main aspects: sensing and regulation, and transmitting real-time data for remote monitoring.

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I. INTRODUCTION

Many food crops depend on certain weather conditions to grow and produce fruits. The effects of climate change pose a serious threat to the agriculture industry in tropical nations. This is due to variations in weather patterns, which affect crop yields and productivity in these regions (Chemura et al., 2020).

Climate change is inherently dangerous to crop productivity. Temperature has a big impact on how quickly plants grow, thus if temperatures rise and shorten the developmental stages of determinate crops as a result of climate change, the yields of that species would probably decline (Crawford and Wheeler, 2009).

Many farmers and investors in the farming sector of Ghana's economy experience many hardships due to unprecedented changes in weather conditions. Due to Ghana's dependence on rain-fed agriculture and sensitivity to drought, as well as the fact that less than 2% of the country's agricultural land is irrigated, changing climatic circumstances constitute a danger to the sector's growth (Chemura et al., 2020b). Several farmers have lost a large part of their crops and produce to unfavourable climatic conditions. This happens mostly because most farmers are unable to adequately monitor and regulate the conditions their crops are exposed to whiles on the farm (Pusatkar and Gulhane, 2016).

Some farmers try to undertake proper measures to ensure their crops do not fall prey to poor weather and neglect. However, for much of the work done to ensure the crops on the farms are exposed to the best of conditions, manual labour is employed. Most research into the agricultural sector aims to significantly reduce the employment of manual labour in the monitoring and regulation of farm conditions. Employing manual labour as a means of monitoring and regulating farm conditions can prove to be very unrewarding due to poor judgment and unreliability (Gallardo and Sauer, 2018).

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In the case where manual labour is acquired, there still exists a significant cost in training these personnel in the use of relevant technologies. There is also a lot of cost involved in acquiring and maintaining high-end technologies that ultimately produce minimum results (Virk et al., 2020). The objective of this research is to design an experimental model of a greenhouse that can regulate the internal temperature and light, monitor the soil moisture content of the greenhouse, and send the data to a designed webpage to facilitate remote monitoring.

II. RELATED WORKS

The adaptation of greenhouses as a means of farming has recorded a lot of positive feedback. Precision agriculture, data processing, and smart farming advancements are driving a revolutionary change in closed-field agriculture. From simple covered greenhouse constructions, protected cultivations have developed to cutting-edge plant factories that maximise both plant and labour output (Shamshiri et al., 2018). To manage the local climate and grow crops all year long, even in harsh outside circumstances, greenhouse agriculture is seen to be a feasible alternative and sustainable option that can address the coming food crisis. It is believed that Internet of Things (IoT) technologies, including smart sensors, devices, network topologies, big data analytics, and intelligent decisions, will answer greenhouse farming problems, including local climate control in greenhouses, crop growth monitoring, crop growth monitoring, crop harvesting, and other issues (Rayana et al., 2020).

Doshi et al., (2019) proposed a technology which can alert farmers of the conditions of their crops by generating messages on varied platforms. The technology will help farmers by giving them access to real-time data from the farms (temperature, humidity, soil moisture) so they can take the necessary steps to practise smart farming, improve crop yields, and conserve resources (water, fertilizers). The device described in this paper makes use of the ESP32 Node MCU, a breadboard, the DHT11 Temperature and Humidity Sensor, the Soil Moisture Sensor, the SI1145 Digital UV Index / IR/ Visible Light Sensor, jumper wires, LEDs, and a serial monitor to display live data feed. It also uses the Blynk Mobile app.

Nicolosi et al., (2017) also developed a similar system. This work demonstrates an adaptive control system designed to govern the microclimate in a greenhouse by combining creative soft computing approaches. Specifically, a neural network strategy has been suggested to anticipate the greenhouse's climatic behaviour, while a parallel fuzzy scheme approach is used to modify the fan-air coil's speed and temperature. Due to the system's capacity to make immediate decisions on both observed variables and anticipated climatic change, the suggested integrated method offers greater management of greenhouse climatic conditions.

Another related project is that of Kodali et al., (2016) on the theme, "IoT based Smart Greenhouse". The model of a smart greenhouse provided by this work enables farmers to carry out farm work automatically without relying heavily on manual inspection. As a closed structure, a greenhouse shields plants from harmful weather elements like wind, hail, ultraviolet rays, and insect and pest attacks. Agricultural fields are irrigated using automated drip irrigation, which runs in line with the soil moisture threshold set appropriately to provide the plants with the ideal amount of water. Drip irrigation techniques may be used to apply the right quantities of nitrogen, phosphorous, potassium, and other minerals based on information from the soil health card. An ultrasonic sensor is used to measure the present water level before building the appropriate water management tanks and adding water to them. Growing lights are used at night to provide plants with the necessary wavelength of light. Humidity and temperature sensors, together with a fogger, are used to regulate temperature and air humidity.

Short Message Service (SMS) from Subscriber Identity Module (SIM) is used to regulate a tube well. Beehive boxes are used for pollination and ultrasonic sensors are used to monitor the boxes, measure the honey, and send emails to the purchasers when the boxes are full. Additionally, the data gathered from storage containers is transferred to a cloud service (Google Drive) and can be sent to an online retailer.

III. GREENHOUSE AUTOMATION TECHNOLOGIES

Automation technologies used in greenhouses include agricultural automation for crop growth, remote monitoring and control systems, and Artificial Intelligence (AI) technology. According to Levonevskiy, et al. (2023), Agricultural automation aims to reduce time and cost of crop production and minimize human errors. A study conducted by Moreno, et al. (2023) showed how remote monitoring and control systems utilize voice command recognition and mathematical models for analysing environmental parameters. AI technology is used for optimizing crop yields, water and fertiliser use efficiently, pest and disease control, and energy management (Maraveas, 2022). Robotic systems, bio-inspired algorithms, and image signal processing are employed for various greenhouse processes (Starikov, Gribanov and Starikova, 2022). Additionally, AI-based irrigation and soil fertiliser application have shown higher returns on investments and resources efficiently. Combined irrigation systems, such as low-volume drip and aerosol irrigation, are also used, with electrochemical activation of water expanding the technological modes of irrigation. These automation technologies aim to improve efficiency, reduce costs, and enhance agricultural sustainability in greenhouse farming.

IV. REMOTE MONITORING SYSTEMS

Remote monitoring systems play a crucial role in greenhouse management by providing real-time monitoring and control of environmental parameters. According to Bo (2023) and Zhu et al (2022), in their studies, emphasised how these systems allow farmers to remotely monitor crop growth and adjust environmental factors such as temperature, soil moisture, and light intensity. By using IoT technology and deep learning algorithms, intelligent agriculture monitoring systems can effectively collect and analyse data on greenhouse temperature, carbon dioxide, light, and other environmental factors (Agilesh Saravanan *et al.*, 2023). The data collected can be stored and accessed through cloud platforms, enabling farmers to monitor and control their greenhouses from anywhere (Chen *et al.*, 2022). Additionally, remote monitoring systems can notify farmers of any anomalies or issues through mobile applications, allowing for timely intervention (Mellit *et al.*, 2021). These systems improve efficiency, reduce management costs, and enhance the quality of crop production in smart greenhouses. The concept of remote monitoring and control is transforming greenhouse farms operations across the globe. This innovative technology allows the farmer to manage and oversee greenhouse processes, assets, and systems from a distance, offering unparalleled convenience, efficiency, and insight.

V. COMPONENTS OF GREENHOUSE AUTOMATION

This research consists of a system that senses the conditions within the enclosure of the greenhouse and sends live data to the webpage for viewing using the Serial Peripheral Interface Flash File System (SPIFFS). The research can be considered within two distinct contexts: Sensing and regulation and transmitting live data to enable remote monitoring. The conditions within and immediately around the greenhouse are measured using designated sensors connected to the ESP32 Microcontroller. These sensors include a DHT11 Temperature and Humidity sensor for determining the environment's temperature and humidity. It also includes a soil moisture sensor to detect the amount of moisture within the soil, and a light sensor to turn on or off the lights depending on the intensity of the natural light within the surroundings of the greenhouse. There is also a water level sensor to keep record of the

level of the water in the irrigation tank. The system is powered by an AC to DC power supply. The system has a fan and bulb inside the greenhouse. The fan is turned on when the temperature exceeds a limit of 32°C to help cool the environment. The Bulb is turned on when the natural light in the immediate environment of the greenhouse drops below a certain percentage intensity. The data received from the sensors are sent to the microcontroller which is then rerouted and sent to the webpage for monitoring. This is done using the SPIFFS server.

The Prototype of the greenhouse mimics the functioning of a regular greenhouse. Typical crops that can be grown using this system include regular-sized fruit-bearing crops as well as vegetables. The greenhouse can be mounted in any location with adequate sunlight and ventilation. Figure XX shows the experimental model of the greenhouse automation.

Fig.XX: Experimental model of greenhouse

The setup was done by connecting different devices with specific purposes which come together to ensure the system works together as a unit to achieve the objective of the research. The project aims to automate the regulation of the conditions within the greenhouse using sensors and fuzzy logic. Fig xx shows the hardware setup of the greenhouse. The setup was done using three principal components:

i. The ESP32 Microcontroller
ii. Breadboard
iii. Jumper Wires.

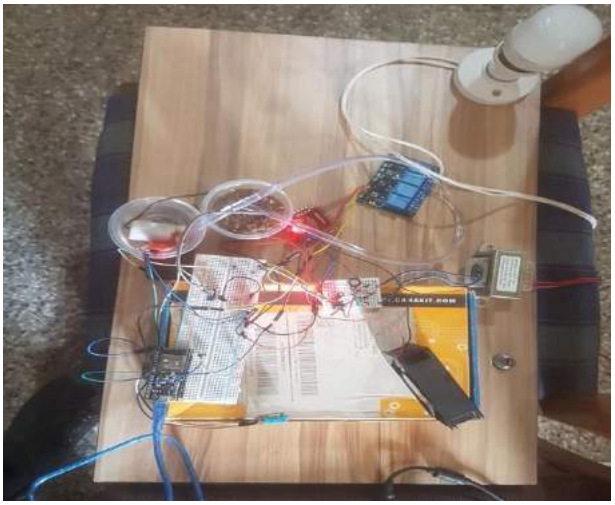

Fig.XX: Hardware Connection of System

The Microcontroller, the breadboard and the wires are used to ensure that the sensors and other devices within the system interface with each other successfully. The Microcontroller has limited pins and connecting all the devices directly may overcrowd the setup. The breadboard serves as an extension for the microcontroller to allow for better connections while ensuring a closed loop. It fundamentally ensures a successful basic circuit.

The ESP32 Microcontroller processes the data received from the sensors to activate the necessary devices using its processor. It has preinstalled firmware that allows it to coordinate communication between the peripherals.

The Jumper wires are a solderless means of connecting the microcontroller and the other components of the system.

VI. CIRCUIT CONNECTION

The main power source of the system was a DC power source adapted from an AC/DC power converter. To ensure that power is supplied to the entire system, the power from the converter is connected to the breadboard and the other components including the microcontroller is connected to the power strip on the breadboard. The ground however is connected from the ESP32 ground pin to the breadboard. The other sensors and devices connect to the ground from the extension on the breadboard. All these connections are done with the help of the jumper wires.

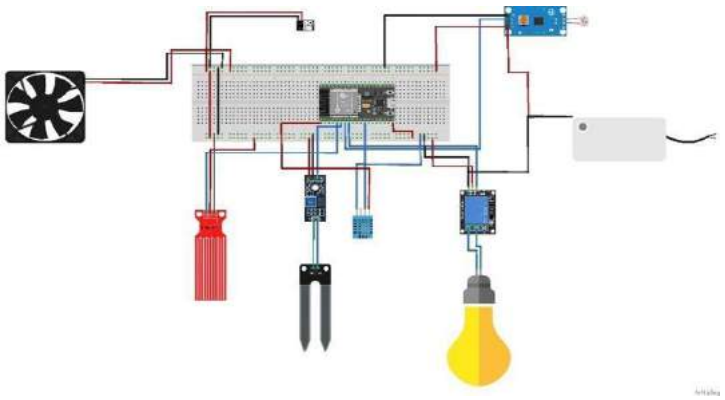

Fig.XX: Circuit Diagram

6.1 DHT11 Temperature and Humidity Sensor

i. The signal pin of the DHT11 temperature and Humidity sensor is connected to digital pin 14 on the ESP32 microcontroller.
ii. The Ground pin is also connected to the Ground (-) bus on the breadboard.
iii. The power is tapped from the breadboard by connecting the VCC pin to the Positive (+) bus on the breadboard.

6.2 Moisture Sensor

i. The moisture sensor was also connected to pin 35 on the microcontroller.
ii. The Ground pin is also connected to the Ground (-) bus on the breadboard.
iii. The power is tapped from the breadboard by connecting the VCC pin to the Positive (+) bus on the breadboard.

6.3 Water Sensor

i. The water sensor was also connected to pin 34 on the microcontroller.
ii. The Ground pin is also connected to the Ground (-) bus on the breadboard.

iii. The power is tapped from the breadboard by connecting the VCC pin to the Positive (+) bus on the breadboard.

6.4 Photosensor (LDR)

i. The photosensor was also connected to pin 32 on the microcontroller.
ii. The Ground pin is also connected to the Ground (-) bus on the breadboard.
iii. The power is tapped from the breadboard by connecting the VCC pin to the Positive (+) bus on the breadboard.

6.5 Bulb

i. The bulb channel signal was also connected to pin 33 on the microcontroller.
ii. The Ground pin is also connected to the Ground (-) bus on the breadboard.

The power is tapped from the breadboard by connecting the VCC pin to the Positive (+) bus on the breadboard.

6.6 Fan

i. The Fan output pin was also connected to pin 25 on the microcontroller.
ii. The Ground pin is also connected to the Ground (-) bus on the breadboard.
iii. The power is tapped from the breadboard by connecting the VCC pin to the Positive (+) bus on the breadboard.

6.7 Pump

i. The pump output pin was also connected to pin 12 on the microcontroller.
ii. The Ground pin is also connected to the Ground (-) bus on the breadboard.

The power is tapped from the breadboard by connecting the VCC pin to the Positive (+) bus on the breadboard.

VII. IMPLEMENTATION AND TESTING

i. The system employs the use of several sensors in the development process. These sensors are responsible for measuring certain variables and act indirectly as actuators. When the readings recorded correspond with certain predetermined values, particular devices within the greenhouse are activated. The microcontroller has a set of preloaded functions that help to control the sequencing ordered by the logic implemented by user-inputted instructions. The main processes of the system include;
ii. The reading of temperature and humidity values within the greenhouse. The readings are sent to the microcontroller for processing. The value of temperature is stored and analysed using predefined fuzzy logic. If the value of temperature goes beyond 32°C, the fan is activated. The logic at that stage iterates till the fan goes off when the temperature falls below the threshold.
iii. Similar to the other DHT11, the soil moisture sensor reads the moisture content of the soil and transmits that data to the microcontroller. The microcontroller processes the data and implements similar logic as the one performed on the data from the temperature sensor. The readings were recalibrated and expressed as a percentage. When the moisture content falls below the lower limit of 20%, the DC pump is automatically activated. It pumps water into the soil. The pump is activated for as long as the moisture content of the soil is below the lower limit and goes off when it detects moisture above the 20% minimum value.
iv. The Photosensor detects the intensity of light in the surrounding environments of the greenhouse. Similar to the soil moisture sensor, its readings were expressed as a percentage. The logic was to activate the bulb once the surrounding light dropped in intensity below the minimum value and turn off the bulb once the intensity of light rises above the given value.

v. The water sensor was also used to measure the level of water in the tank. This is to make sure the farmer always knows when to refill the tank to ensure the crops are always irrigated.
vi. All the data transmitted to the microcontroller are processed and delivered to the webpage through the Wi-Fi module. The data displayed on the webpage is live. This means the farmer would have real-time data concerning the state of the greenhouse.
vii. The system iterates this process as long as it is powered and connected to a network.

VIII. DATA ANALYSIS AND DECISION SUPPORT

The conditions necessary for the activation of the devices within the greenhouse were stimulated to ensure their efficiency. The devices responded positively to the changes in the conditions accurately. Figure xx shows the webpage displaying the data from the sensors and the state of the devices in desktop mode.

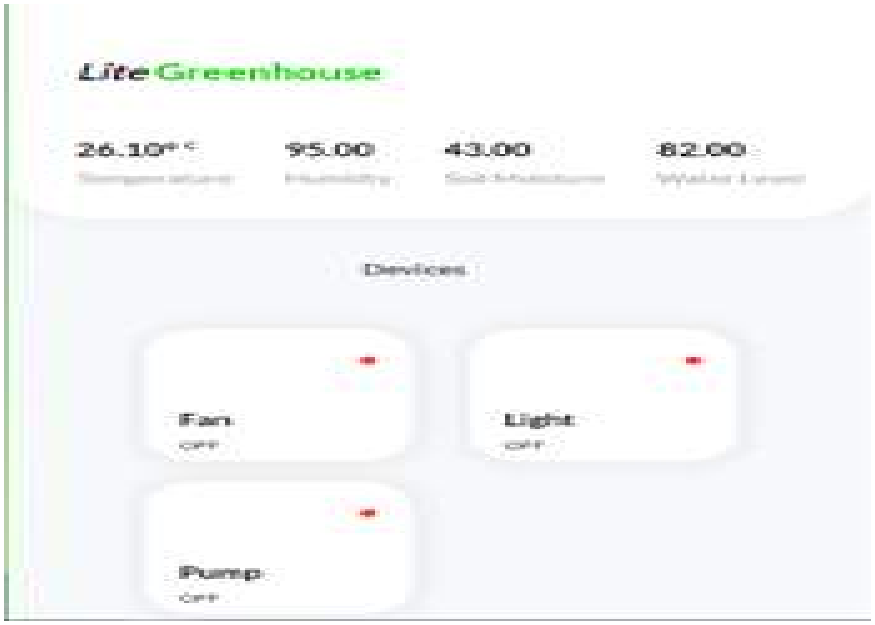

Fig.XX: Web interface

VIIII. CONCLUSION

The objective of the project was to develop a prototype of a greenhouse that had automated functions to regulate the conditions of the greenhouse. This was achieved using an ESP32 microcontroller and several sensors as well as some regulatory devices. The system is fully automated when connected to a power source and a network. To enable the farmer to monitor the state of the greenhouse, the data is transmitted to the webpage accessible on the network. It is therefore rational to say that the system is operational and can be modified and enhanced to perform the automation on a larger and more effective scale.

Several issues can be addressed to ensure the system is fully operational. The power source can be changed to a solar source. This will enable the system to be set up in locations where electricity is not accessible. The SPIFFS method can also be upgraded to a larger network to allow monitoring from farther locations.

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Forensic Anthropology Cases in Uruguay: An Update (1992-2023)

Dr. Solla, Horacio E

ABSTRACT

The article presents an update of a quantitative analysis of the forensic anthropology cases that occurred in Uruguay from 1992 to 2023. The number of forensic anthropology cases has rapidly increased in Uruguay. Over 30 years this number had rise from 14 cases in 1992 to 75 cases in 2023, reached a maximum number of cases in 2006 and 2013, ascending to 91 cases for each year. Forensic anthropology cases processed between 1992 and 2023 at the Judicial Morgue of Montevideo ascending at the present to 1752. The Laboratory of Forensic Anthropology at the Judicial Morgue of Montevideo City was created in 1992, as a response to the need to address the backlog of cases. Since 1992 all the remains were analyzed to determine sex, stature and age at the time of death and, eventually the identity of the remains. In cases where a positive identification was made, a forensic anthropology analysis was also performed. The purpose of this paper is to describe the place of forensic anthropology in the Uruguayan medico-legal system, the evolution an increase of the number of cases from 1992 to 2023 and, to show its effectiveness in identification of human remains.

Keywords: forensic anthropology cases. forensic anthropology laboratory identification. uruguay.

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Keywords: forensic anthropology cases. forensic anthropology laboratory identification. uruguay.

I. INTRODUCTION

Forensic anthropology has been one of the fastest growing of all forensic sciences, and its scope has been described by several authors (1-3). Its growth in the US has been attributed to scholars such as Wilton M. Krogman and J. Lawrence Angel (4, 5). T. Dale Stewart (6) carried out much of the pioneering research and Krogman defined the field (7). Other forensic anthropologists (8, 9) have also appreciated importance of research and practical needs globally. The growth of the field has been recorded in many countries (6, 10-16).

The study of the facial surface has always been of high interest to forensic anthropologists when identifying human skulls (17). Digital superposition is a common method of identification used by forensic anthropologists around the world (18). The technique of skull-photo superimposition has been used to assist in the identification of numerous victims and is accepted in courts in a number of countries (19-33). The scientific principles of this method were very well described in specialized literature (34-41). Adding a computer to this technique greatly improves it, adding a number of advantages and new possibilities (42-51).

In the last 30 years, forensic anthropology has been an active part of Uruguay's coroner system (52,53). The Forensic Institute at Montevideo City assigns medico-legal studies to the Forensic Medicine Department. Autopsies and other types of forensic studies, such as anthropological, are carried out at the Judicial Morgue of Montevideo City by the resident forensic anthropologist (54). The number of forensic anthropological cases has increased considerably since the 1992 inclusion of a forensic anthropologist to the medico-legal team. This eventually led to a higher rate of positive identification of skeletal remains (16).

Since its establishment in 1992, the Laboratory of Forensic Anthropology has given assistance to the coroner and legal authorities in several criminal involving the study of human skeletal remains (16), this concerns skeletonized, decomposed and burned human remains.

Generally, forensic anthropology cases are submitted to forensic anthropologists by coroners and legal authorities. When a positive identification is made based on a forensic anthropologist official report, the coroner signs the death certificate. Therefore, since 1992 the forensic anthropologist is an official consultant of the Forensic Medicine Department at Montevideo City (16).

It is very important to note that before 1992, all recovered skeletal remains were buried with no name and not anthropology examination was made by the pathologist or medical examiner. Since the creation of the Forensic Anthropology Laboratory at the Judicial Morgue of Montevideo City in 1992 more than 250 people have been identified by skull-photo comparison using digital superimposition technique. These positive identifications were later corroborated by dental or DNA studies.

The purpose of this paper is to present an update of the position of forensic anthropology in the Uruguayan medico-legal system, the higher amount of cases and, to show successful of skull-photograph comparison techniques are when used to identify human remains.

II. MATERIALS AND METHODS

The period analyzed was from 1992 to 2023 where the Laboratory of Forensic Anthropology had an active role in the study and identification of human remains. The year 1992 was considered as the foundation of the Forensic Anthropology at the Morgue Judicial of Montevideo city.

In 1992 the Forensic Anthropology Laboratory at the Judicial Morgue of Montevideo City was established. Since 1992 until 2023, 1752 forensic anthropology cases were analyzed. The human remains came from all over the country, including Montevideo City. All cases were assessed for the estimation of age at death, stature, sex, racial affinity, cause of death and eventually its identification. Condition of the remnants regarding decomposition and whether or not a positive identification was made was also noted. Most of the human remains were found in woods, fields, parks, rivers and lakes. Other remains were others recovered from locations like burned cars, septic tanks, highways, construction sites and abandoned houses. Those recovering the remains were typically police or civilians. Positive identifications when available were made from the Forensic Anthropology Laboratory at the Judicial Morgue of Montevideo City using skull-photo comparison techniques or by comparison of dental records. According to skull-photo superimposition techniques, two photographs showing frontal and lateral views are required for an accurate identification by the technique. Photographs were the placed under the video camera and illuminated by white fluorescent lamps. The image was adjusted on the computer monitor, and it was digitized by the video mixer unit and stored in the computer as a JPG file using a capture card device. Then, using a computer and an appropriated software, some key facial anatomical landmarks were traced (55). Moreover, eight examining lines introduced by Cai and Lan (39) were considered. Respecting all of these landmarks and lines, several comparisons lines, and other comparisons, are captured using an application of the digital mixer outside of an appropriated software. The skull is illuminated by fluorescent lamps and placed under the video camera. It is then manipulated by a servo motor until its position is seized in that of the individual in the photograph. After the skull has been adjusted in the optimal position, a photograph is captured and adjusted to fit as closely possible to that of the individual on the photograph. Afterwards, the image of the skull is digitized using the digital video mixer unit and then stored as JPG file in the computer. Then, both images are stored in the computer (skull and photo) and superimposed using an appropriated software for a more detailed comparison. This technique permits the desired combinations of skull-photo appraisal, including removal of soft tissue to view the underlying skeletal structures such the auditory

canal, zigomatics, jawbones, nasal root, dentition, chin, skull contours and so on. The entire process may be the recorded by the computer unit and good quality photographs can be made by a computer printer to be attached to a forensic report.

III. RESULTS

From the period of analysis (1992-2023) the number of forensic anthropology cases increased from 14 in 1992 to 75 in 2023. About 59% of the cases from this period came from Montevideo Department, this is the smallest and most populated of the 19 Departments in Uruguay, having almost 2 million people within its scope and 41% were from the rest of the country (56).

Forensic anthropology cases increased in the period analyzed (1992-2023) from 12 cases in 1992 to 75 in 2023, reaching a higher number is cases from 2006 and 2013 with 91 from each year. All cases where human skeletal remains were identified using skull-photo comparison techniques assisted by a computer sa well as dental records reached 240 cases.

IV. DISCUSSION

The only accurate indicator of assessing a specific method's contribution of the field is to quantify its practical application. Before 1992, forensic anthropological studies were not given serious consideration in Uruguay. Human remains, when discovered, were analyzed by coroners or medical examiners with little or no training in forensic anthropology. Most considerations were reduced to the determination of possible cause of death. Generally, remains could not be positively identified, so they were buried as unknown. As a solution to this problem, the Forensic Anthropology Laboratory was created at the Morgue Judicial of Montevideo City in 1992.

Ever since its establishment as a section of the Morgue Judicial, the number of anthropological cases analyzed has been increasing. Thus, an upward trend is best illustrated by a modest number of 20 cases in 1992 that had gone up in a moment to 75 cases in 2023, reaching 91 cases by 2006 and 2013. Therefore, forensic anthropology has become an integral part of the medico–legal disciplines and its investigative branch all around the world. The scientific contributions of forensic anthropology to identifying human remains and solving crime have been written up in literature by many scientists. It has been shown that participation of a trained forensic anthropologist can contribute considerably to the speedy identification of unknown cases and resolution of the crime.

This paper shows that in Uruguay the number of cases receiving expert evaluation has risen yearly over the last 30 years. This is likely due to the establishment of a forensic anthropology laboratory in the medical examiner's complex. Without doubt, this increase in case studies can be attributed to the familiarity of the service this new field can offer to law enforcement agencies and coroners. The location of the laboratory at the Morgue Judicial of Montevideo gave an opportunity to medico-legal officers to have an easy access to this service. The rate of positive identification has also improved considerably and comparable to other statistics in the USA (57).

According to the judicial forensic anthropology´s files found at the Morgue of Montevideo City there were 1752 forensic anthropology cases from 1992 to 2023. In the majority of cases the remains were found by police or civilians in forests, fields, parks, lakes, or rivers. Some were found in burned cars, on highways, or in abandoned houses. All of the forensic anthropology cases were analyzed to determine the number or people, age at time of death, sex, stature, racial affinity, stage of decomposition of the remains (fresh, advanced decomposed, burned, or skeletonized), and eventually when it is possible a positive identification was made. Skull-photo digital superposition was used for identification purposes with available equipment at the Morgue Judicial of Montevideo City, together with other methods like

DNA, radiography or dental studies. However, skull-photograph comparisons by digital superposition assisted by computers was the most useful method used in identifying human remains in Uruguay from the period 1992-2023. This included a total of 240 cases which were solved and identified these techniques and, the number of people identified with skull-photo comparison techniques can be easily compared to that provided by others (57,58). This comparison of results confirms that the establishment of the Forensic Anthropology Laboratory at the Judicial Morgue of Montevideo has vastly enhanced the scientific community's ability to identify human skeletal remains in Uruguay.

However, the rate of identification in Uruguay depends on a number of facts. First, law enforcement agencies may not be knowledgeable about what pieces of data are relevant to help obtain a positive identification. Second, positive identification may be very difficult when no missing people have been reported. Factors of individualization are the process whereby a set of unique skeletal characteristics is matched with those of a missing person (2). Therefore, a positive identification could not be established when there are no comparative records. Third, dental records are particularly difficult to obtain in Uruguay as well as many other countries in Latin America. This is because dental health is poor and minimally maintained by most people due to the high cost. However, forensic anthropological work has made a significant positive contribution to the medico–legal system in the last 30 years in Uruguay. The number of cases increased to a level obtained in other more technologically advanced countries (57,58).

V. CONCLUSION

Today, forensic anthropology has been integrated into forensic teams in the majority of countries around the world. It is also working its way into medico-legal systems around the world. Scientific literature has described numerous times in which forensic anthropology has solved crimes or identified skeletal remains. Clearly, it is important to have a well-trained forensic anthropologist available when human skeletal remains are found and positive identification must be made. The number of forensic anthropology cases has growth in Uruguay over the last 30 years, from 14 cases in 1992 to 75 in 2023, reaching the higher number in 2006 and 2013. Hopefully, in future cases, there will be an even higher percentage of positive identifications. All anthropological forensic investigations were commencing with initial observations about the sex, age, race and stature, time since death and cause of death. Skull-photo comparison was made by the digital superimposition using a computer. It showed sufficient consistency between the skulls and the facial photographs submitted for comparison. But the success in identification of human remains using skull-photo comparisons depends upon the quality of the submitted photograph as well as correct positioning of the skull and mandible. Although the remains were identified by skull-photo superimposition, results of another technique were used as evidences and incorporated in the final report, such as radiography, dental or DNA studies. The latter were consequently found to be in agreement with the identification based on skull-photo comparison.
Forensic anthropological contributions to the Uruguayan medico-legal system have increased in the last 30 years. The number of cases in which positive identifications have been reached is similar to those of the US and European countries. It should be noted that according to actual tendencies, forensic anthropology cases are increasing. Among the reasons that explain this increase are the following:

a. The creation of the Forensic Anthropology Laboratory at the Judicial Morgue of Montevideo City in 1992, this made it easier for medical examiners and coroners to contact the resident forensic anthropologist when needed.
b. The creation of a full-time Resident Forensic Anthropologist position at the Laboratory in 1992.
c. The ability to have a trained forensic anthropologist working in a forensic team with medical examiners, coroners, dentists and radiologists.

d. A better knowledge of the scope of this modern branch of forensic science by the medico-legal system as a whole.
e. The high percentage of positive identifications carried out by the Forensic Anthropology Laboratory from the period 1992-2023.

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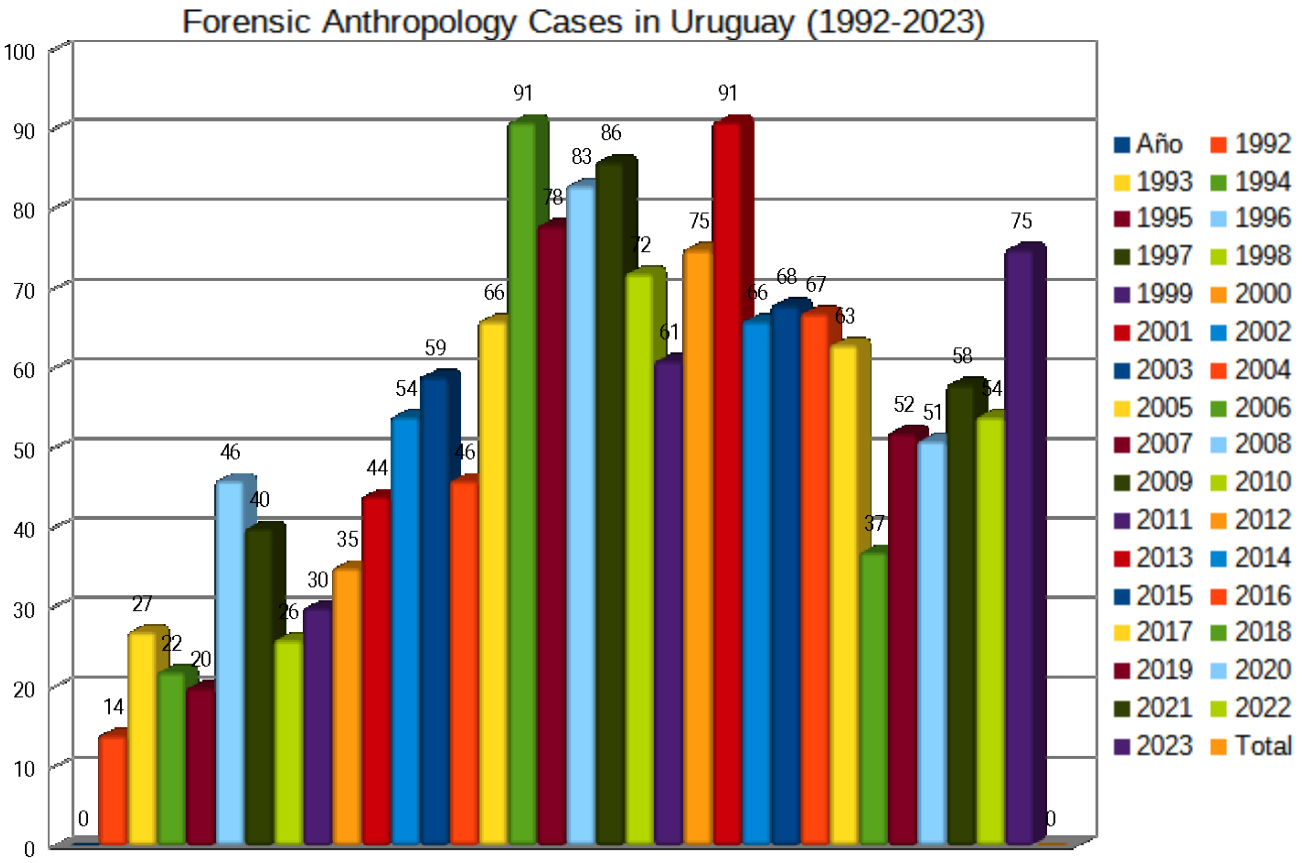

Level of Awareness of Boat Captains in Terms of International Regulations for Preventing Collision at Sea in Region V1

Sheila M. Picpican

ABSTRACT

The safety of life at sea is a very important aspect in terms of navigation. The purpose of the study is to determine the level of awareness of the Boat Captains in terms of sounds and light signals and lights and shapes on Collision Regulations by using the validated questionnaires that the author was provided based on the International Collision Regulations for Preventing Collision at Sea. The study was conducted in the different areas of Region V1 namely: Boracay Island Malay, Aklan, Estancia, Roxas City Capiz, and Guimaras Province. The study was conducted last November 2018 to November 2019. Participants of the Modified Basic Safety Training Course with Typhoon Awareness and Collision Regulations conducted by the Maritime Industry Authority, Region VI Iloilo City, and Iloilo State College of Fisheries, were utilized as respondents of the study. The respondents were composed of One Hundred Eighty boat captains through stratified sampling using Slovin's formula. A qualitative/Quantitative research design was employed in the study. Open-ended validated questionnaires were administered to the selected respondents. Focus group discussion was conducted to get reliable data from their personal experiences at sea. Answered questionnaires were gathered, tabulated, and analyzed using appropriate statistical tools.

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I. INTRODUCTION

Basic safety training offers maritime students as well as professionals different training on personal survival techniques, disaster management, and others while disaster preparedness is a process of ensuring that an organization has complied with the prevention measures. It is assumed as a state of readiness to contain the effects of a forecasted disastrous event to minimize loss of life, injury, and property damage. It is extensively defined as a way to provide rescue, relief, rehabilitation, and other services in the aftermath of a disaster. It entails the capability and resources to continue to sustain its essential functions without being overwhelmed by the demand placed on them, first and immediate response – emergency preparedness. Training is not a "recreational" luxury to be implemented when times are good, but a continuous effort that is even more valuable when times are rough. Proper planning of disaster awareness and disaster preparedness activities in isolation from people's daily lives and everyday concerns will rarely succeed. This is because people's interest in disaster preparedness fades if it has been a long time between disaster events. Typhoons affect the natural environment and cause harm to trees and other vegetation, including crops that communities may rely on for sustenance trade or both. In addition, these typhoons not only destroyed agricultural and industrial properties but also killed thousands of lives. Equally, the Philippines is a nation surrounded by water. In so much so,

the nation sees many water-related accidents and disasters on a yearly basis. Thousands of people have been killed by ferry and boating accidents in the Philippines. Due to the fact, that our nation consists of 7,563 islands, and many are not able to afford air travel or are located too remote to an airport facility, ferry boats are the predominant mode for national travel. Likewise, bad weather, especially during typhoon season, poor maintenance, overloading of vessels -- especially during the Christmas season as families return to their villages for reunions -- and lax enforcement of regulations have brought many tragedies. Natural disasters caused by eliminate change are among the greatest threats faced by the world, especially the developing countries.

II. STATEMENT OF THE PROBLEM

This study aims to determine the level of awareness of the Boat Captain in terms of sounds lights signals and light and shapes on Collision Regulations.

1. What is the level of awareness of the Boat Captains in terms of sounds and light signals on Collision Regulations?
2. What is the level of awareness of the Boat Captains in terms of lights and shapes on Collision Regulations?

III. METHODOLOGY

This chapter presents the research design, locale of the study/site, respondents, sample size, sampling technique, research instrument, data gathering procedure, and data analysis.

3.1. Research Design

Descriptive qualitative/quantitative research design.

3.2. Locale/Study Site

Selected areas in Region VI namely: Boracay Island Malay, Aklan, Estancia, Roxas City Capiz, and Guimaras

3.3. Respondents

Boat Captains in selected areas in Region VI namely: Boracay Island Malay, Aklan, Estancia, Roxas City Capiz, and Guimaras

3.4. Sampling Techniques

Stratified sampling using Slovin's formula

3.5. Research Instrument

Validated Survey Questionnaires in sounds and light signals and light and shapes based on international collision regulations 1972.

3.6. Data Gathering Procedure

Propose the MBSTC training with Typhoon Awareness to be approved by the President of the Administration then after the approval sends an invitation letter to the MARINA for the resource speaker and after the approval make a courtesy call to the Mayor of every selected area to inform about

the training to be conducted after the approval of the Mayor coordinate with the president of the organization and met the boat owners to inform the training to be conducted by the MARINA and ISCOF so that they will inform their crew to participate in that said training.

3.7. Data Analysis

Data gathered will be recorded and subject to statistical analysis.

IV. RESULTS AND DISCUSSION

4.1 Findings with analysis and interpretation

The study aimed to know the level of awareness of Boat Captains in selected areas of Region V1. It also assessed the experiences of the Boat Captains in maneuvering and handling the ship in terms of bad weather. The response for each question and its findings are presented in the succeeding table.

The Level of awareness of sounds and light signals result was presented using the following:

Scale		Description
5	5.00 - 4.21	Very Much Knowledgeable
4	4.20 - 3.41	Much Knowledgeable
3	3.40 - 2.61	Knowledgeable
2	2.60 - 1.81	Less Knowledgeable
1	1.80 - 1.00	Very Less Knowledgeable

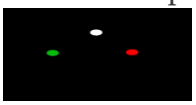
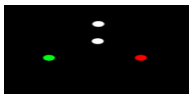
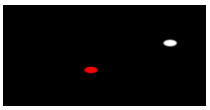
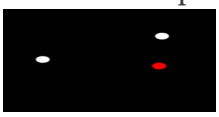
The following tables are the results of the pretest exam on sounds and light signals on collision regulations.

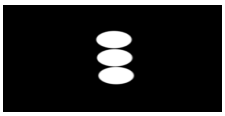
Item	Correct	Wrong
1. One short blast to mean. (Isa ka utod nga pag busina)	124	58
2. Two short blasts to mean (Duha ka utod utod nga pagbusina)	103	79
3. Three short blasts to mean (Tatlo ka utod utod nga pag busina)	120	62
4. One flash to mean (Isa ka pag igpat sang suga)	114	68
5. Two flashes to mean (Duha ka pag igpat sang suga)	94	88

The Level of awareness in lights and shapes result was presented using the following:

Scale		Description
5	8-10	Very much knowledgeable
4	6-7.99	Much Knowledgeable
3	4-5.99	Knowledgeable
2	2-3.99	Less Knowledgeable
1	0-1.99	Very Less Knowledgeable

The following tables are the results of the pretest exam on light and shapes on collision regulations.

Item	Correct	Wrong
1. What does this represent? 	121	61
2. What does this represent? 	120	62
3. . What does this represent? 	124	58
4. What does this represent? 	114	68
5. What does this represent? 	105	77
6. What does this represent? 	98	84

7. What does this represent? 	108	74
. What does this represent? 	102	80
9. What does this represent 	92	90
10. What does this represent? 	82	100

The result of the mean on the pretest in sound and light signals and the pretest in lights and hapes.

T-test

	Mean	N	Std. Deviation	Std. Error Mean
Pretest in sounds and light signals	3.0495	182	1.34730	.09987
Pretest in lights and shapes	5.8571	182	2.13920	.15857

V. CONCLUSIONS

- In terms of sound and light signals in the pretest result the highest score is item number one. One short blast to mean (isa ka utod nga pag busina) got 124 respondents answered correctly out of 182 respondents.
- In terms of light and shapes the pretest result in the highest item is number three 124 respondents answered correctly.
- Based on the T-test result the mean of sound and light signals in the pretest is 3.0495 which means that it is knowledgeable based on the scale I was presented.
- Based on the T-test the result of the mean of light and shapes in the pretest is 5.8571 which means that it is knowledgeable based on the scale that I was presented.

RECOMMENDATIONS

The result of the research study the following recommendations were drawn:

- The training on Collision Regulations for the boat captains must be continued to improve their level of awareness.
- The boat owners must send their boat captains for the training.
- The MARINA must provide a Memorandum Circular about the Boat Captains that they must have a Certificate on the "International Collision Regulations Course" so that they are aware of the Rules of the Road and they can apply their profession and minimize and prevent whatever accidents happen onboard.

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