Knowledge Based Atricle

Smart Watering System

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[https://www.researchgate.net/profile/Sudheer-Nagothu/publication/316031811\_Weather\_based\_Smart\_watering\_system\_using\_soil\_sensor\_and\_GSM/links/5a3a269f458515889d2bd87f/Weather-based-Smart-watering-system-using-soil-sensor-and-GSM.pdf]

*Abstract* — In this article, a prototype of a Smart Watering System will be explained, along with logic gates to give a greater understanding of the prototype. Additionally, all hardware components will be justified as to how each component works with one another to create a complete system, and potential security risks that come with the usage of listed hardware.

# Introduction

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# Literature Review

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## Subheading…

Follow this format if you would like to add a subheading:

## Subheading 2 and so on…

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# Methodology

This smart watering system will provide the user with necessary features to maintain efficient crop yields while staying the most cost-efficient as possible to increase profitability of the user. The proposed water system is able to utilize profession moisture sensors and temperature sensors to collect data that will be manipulated by the master microcontroller in ways such as; sending a message to the slave microcontroller to activate a sprinkler if the value from the moisture sensor drops below a specified threshold, displaying moisture and temperature values on an LCD (liquid crystal display) screen for the consumer to see accurate measurements of the crop’s conditions. These measurements will be collected at regular set intervals as this will prevent the microcontrollers from overflowing with too much data and causing delays in the system. Also, this will allow for scalability for the system itself as the consumer will allowed to connect more data collection nodes to cover more area without causing issues for the already existing system.

The communication protocol that is used between the microcontrollers is the I2C (Inter-Integrated Circuit) protocol, the reason why this is the chosen protocol for this prototype is because the amount of data being transferred is small which won’t have a major impact on the processing speeds and won’t disrupt the communication of the two controllers. Also with future scalability in mind, this communication protocol will be a valid choice as the

due to possible scalability of the connections, via this method a system is allowed multiple masters and slaves

In Figure X below, is a circuit depicting how each component of the system will communicate with each other to demonstrate a prototype of the final product. The circuit consists of:

* 2x Arduino Uno
* 1x LCD screen
* 1x 9v Battery
* 1x DC Motor
* 1x L239D Chip
* 1x Soil Moisture Sensor
* 1x Temperature Sensor
* x Wires

A diagram of a circuit board

Description automatically generated

## Implementation of a Moisture Sensor

Moisture Sensors use dielectric-permittivity [1] to calculates the volumetric content of water in soil to fluctuate the resistance value of the sensor using the built-in variable resistor, this resistance value is then constantly communicated to the connected micro-controller. The resistance of the Moisture Sensor decreases as more water is present in the soil. These sensors will be connected in groups, and transmitting data in groups to their corresponding master node over a wireless connection, to allow for more data collection which can then be averaged to provide more accurate results per area.

[1 - <https://gi.copernicus.org/articles/12/45/2023/gi-12-45-2023.pdf>]

[https://www.researchgate.net/profile/Sudheer-Nagothu/publication/316031811\_Weather\_based\_Smart\_watering\_system\_using\_soil\_sensor\_and\_GSM/links/5a3a269f458515889d2bd87f/Weather-based-Smart-watering-system-using-soil-sensor-and-GSM.pdf]

[https://lastminuteengineers.com/soil-moisture-sensor-arduino-tutorial/]

## Implementation of a Temperature Sensor

Temperature sensors are working alongside moisture sensors, they will be feeding information towards the master node at similar intervals to the moisture sensors, the data collected from these sensors will be displayed to the user on an LCD where each group of sensors will have their temperatures displayed, and the user will be able to toggle which group is being displayed on the screen.

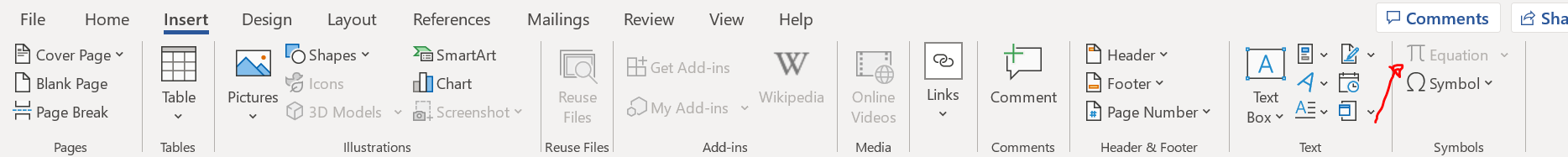
## Implementation of an LCD Screen

LCD Screens will be displaying data gathered from the moisture and temperature sensors

Using the data collected from both moisture sensor and temperature sensor, the micro-controller will be able to control an irrigation system (either a sprinkler network or ) to determine when water should be spraying crops to keep them at their most optimal growth conditions. The microcontroller in charge of the irrigation system will receive a command when to water plants and when to stop from the microcontroller handling the sensors’ data. The commands that are to be sent will be based on default presets (of which they will be most commonly farmed crops) or a custom pre-set can be created by the farmers themselves.

With future development in mind,

Assuming that this subheading consists of your Boolean equation, please ensure you follow the equation format by inserting equation on the above panel as shown below



(The above figure is just for guidance, and so please remove if you are aware of how to insert equations)

Your equation should look like the following (example):

|  |  |
| --- | --- |
|  | (1) |

Note that the equation is centered using a center tab stop. Be sure that the symbols in your equation have been defined before or immediately following the equation. Use “(1),” not “Eq. (1)” or “equation (1),” except at the beginning of a sentence: “Equation (1) is ...”

# Results

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# Discussion

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# Conclusion

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## Some Common Mistakes

* The word “data” is plural, not singular.
* The subscript for the permeability of vacuum **0, and other common scientific constants, is zero with subscript formatting, not a lowercase letter “o.”
* In American English, commas, semi-/colons, periods, question and exclamation marks are located within quotation marks only when a complete thought or name is cited, such as a title or full quotation. When quotation marks are used, instead of a bold or italic typeface, to highlight a word or phrase, punctuation should appear outside of the quotation marks. A parenthetical phrase or statement at the end of a sentence is punctuated outside of the closing parenthesis (like this). (A parenthetical sentence is punctuated within the parentheses.)
* A graph within a graph is an “inset,” not an “insert.” The word alternatively is preferred to the word “alternately” (unless you really mean something that alternates).
* Do not use the word “essentially” to mean “approximately” or “effectively.”
* In your paper title, if the words “that uses” can accurately replace the word using, capitalize the “u”; if not, keep using lower-cased.
* Be aware of the different meanings of the homophones “affect” and “effect,” “complement” and “compliment,” “discreet” and “discrete,” “principal” and “principle.”
* Do not confuse “imply” and “infer.”
* The prefix “non” is not a word; it should be joined to the word it modifies, usually without a hyphen.
* There is no period after the “et” in the Latin abbreviation “et al.”
* The abbreviation “i.e.” means “that is,” and the abbreviation “e.g.” means “for example.”

An excellent style manual for science writers is [7].

## Authors and Affiliations

The template is designed so that author affiliations are not repeated each time for multiple authors of the same affiliation. Please keep your affiliations as succinct as possible (for example, do not differentiate among departments of the same organization). This template was designed for two affiliations.

### For author/s of only one affiliation (Heading 3): To change the default, adjust the template as follows.

#### Selection (Heading 4): Highlight all author and affiliation lines.

#### Change number of columns: Select the Columns icon from the MS Word Standard toolbar and then select “1 Column” from the selection palette.

#### Deletion: Delete the author and affiliation lines for the second affiliation.

### For author/s of more than two affiliations: To change the default, adjust the template as follows.

#### Selection: Highlight all author and affiliation lines.

#### Change number of columns: Select the “Columns” icon from the MS Word Standard toolbar and then select “1 Column” from the selection palette.

#### Highlight author and affiliation lines of affiliation 1 and copy this selection.

#### Formatting: Insert one hard return immediately after the last character of the last affiliation line. Then paste down the copy of affiliation 1. Repeat as necessary for each additional affiliation.

#### Reassign number of columns: Place your cursor to the right of the last character of the last affiliation line of an even numbered affiliation (e.g., if there are five affiliations, place your cursor at end of fourth affiliation). Drag the cursor up to highlight all of the above author and affiliation lines. Go to Column icon and select “2 Columns”. If you have an odd number of affiliations, the final affiliation will be centered on the page; all previous will be in two columns.

## Figures and Tables

### Positioning Figures and Tables: Place figures and tables at the top and bottom of columns. Avoid placing them in the middle of columns. Large figures and tables may span across both columns. Figure captions should be below the figures; table heads should appear above the tables. Insert figures and tables after they are cited in the text. Use the abbreviation “Fig. 1,” even at the beginning of a sentence.

1. Table Styles

| Table Head | Table Column Head | | |
| --- | --- | --- | --- |
| Table column subhead | Subhead | Subhead |
| copy | More table copya |  |  |

1. Example of a figure caption. *(figure caption): Figure caption goes below the image*

Figure Labels: Use 8 point Times New Roman for Figure labels. Use words rather than symbols or abbreviations when writing Figure axis labels to avoid confusing the reader. As an example, write the quantity “Magnetization,” or “Magnetization, M,” not just “M.” If including units in the label, present them within parentheses. Do not label axes only with units. In the example, write “Magnetization (A/m)” or “Magnetization (A ( m(1),” not just “A/m.” Do not label axes with a ratio of quantities and units. For example, write “Temperature (K),” not “Temperature/K.”

We suggest that you use a text box to insert a graphic because this method is somewhat more stable than directly inserting a picture.

To have non-visible rules on your frame, use the MSWord “Format” pull-down menu, select Text Box > Colors and Lines to choose No Fill and No Line.

##### References

Use Harvard Referencing

Eason G, Noble N, and Sneddon N.I, (1995) “On certain integrals of Lipschitz-Hankel type involving products of Bessel functions,” Phil. Trans. Roy. Soc. London