Système d'illumination de trottoir nocturne pour piétons

* ELG 4539: Électronique III

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***Abstract*—Nous avons construits un dispositif capable de différencier les entités sur le trottoir basé sur des capteurs de mouvement infra-rouge et des capteurs de poids, tous reliés à un microcontrôleur Arduino, qui effectuera un CAN sur les signaux analogiques et un Raspberry pi 4 qui effectue une prise de décision basée sur le flux de données reçues.**

***Index Terms*—Raspberry Pi, Arduino, Capteur de Poids, Capteur Infrarouge, Django**

I. Introduction

Le gouvernement du Québec définit la pollution lumineuse comme toute lumière projetée vers le ciel qui obstrue l'observation des étoiles [1]. Cet effet est dû à la projection et la réflexion de la lumière vers le ciel ainsi qu'une surabondance de lumière. Ce phénomène représente un manque d'efficacité dans le déploiement de la lumière. D'un point de vue environnementaliste, c'est aussi un gaspillage d'énergie puisque l'énergie lumineuse qui s'échappe vers le ciel ne contribue pas à la tâche voulue d'un lampadaire, qui est par exemple d'illuminer une rue ou un trottoir.
Les capteurs infrarouges pyroélectriques (PIR) comptent parmi la classe de capteurs détecteurs thermiques [2]. Ces capteurs mesurent la radiation incidente grâce au changement de leur température. Lorsqu'on présente au détecteur un certain matériel absorbant, on peut le configurer pour répondre à une certaine plage de fréquences. Les PIR ont été conçus principalement pour la détection des corps humains, ce qui veut dire que les longueurs d'onde désirées sont de huit à douze micromètres.

II. Conception

A. Conception Matérielle

Pour le hardware du projet, nous avons décidé de sélectionner deux types de capteurs : le HX711 et le SR-501. Le capteur de tension HX711 est composé d'un Wheatstone bridge, ce circuit utilise 4 résistances arrangées comme dans la figure ci-dessous. Le voltage de sortie mesurée varie selon la tension mécanique appliquée sur le membre du capteur. Il suffit par la suite qu'à calibrer ce voltage de sortie à l'aide un poids ou une force connue. Le capteur a une limite de poids de 20 kilogrammes, mais dans le cas des simulations pour ce projet, ce n'est pas un problème.

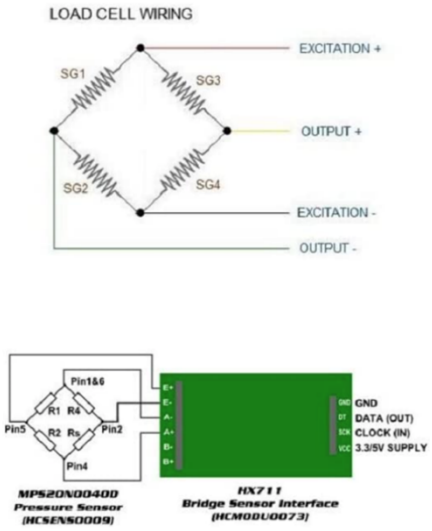

Fig. 1. Capteur de Poids HX711. [3]

Quant au capteurs SR-501, ils fonctionnent en détectant la radiation infra-rouge et en donnant une valeur de sorite binaire, soit 0 ou 1, dépendamment du rapport entre la radiation détectée et un certain seuil. Ces capteurs ont une limitation sur leur temps d'activation. Lorsque la sortie d'un capteur passe de 1 à 0, elle sera prise en mode LOW pour 2 secondes. Cela veut dire que la sortie du capteur sera fixe à 0 pour deux secondes peu importe la radiation mesurée. Ceci prouve être une contrainte pour la conception des cas de test.

Dans notre cas, nous avons 5 capteurs infrarouges et un capteur de poids. Le schéma ci-dessous représente le raccordement des capteurs infrarouges à un Arduino. Le logiciel utiliser

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pour ce schéma ne comprenait pas le capteur HX711 dans sa base de données et l'Arduino Nano non plus. Le HX711 as 4 pins, comme vu dans la figure plus haute, où une pin est pour l'alimentation 5 volts, une autre pour la terre, une troisième pour la pin d'entré digitale du Arduino et la dernière pour l'horloge. [4]

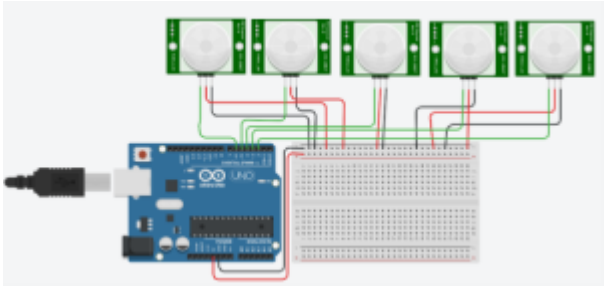

Fig. 2. Intégration de capteurs IR Hc-Sr501. [5]

B. Conception Logicielle

III. Mise en Oeuvre

Before you begin to format your paper, first write and save the content as a separate text file. Complete all content and organizational editing before formatting. Please note sections III-A–III-E below for more information on proofreading, spelling and grammar.

Keep your text and graphic files separate until after the text has been formatted and styled. Do not number text heads—LaTeX will do that for you.

A. Abbreviations and Acronyms

Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract. Abbreviations such as IEEE, SI, MKS, CGS, ac, dc, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

B. Units

- Use either SI (MKS) or CGS as primary units. (SI units are encouraged.) English units may be used as secondary units (in parentheses). An exception would be the use of English units as identifiers in trade, such as "3.5-inch disk drive".
- Avoid combining SI and CGS units, such as current in amperes and magnetic field in oersteds. This often leads to confusion because equations do not balance dimensionally. If you must use mixed units, clearly state the units for each quantity that you use in an equation.
- Do not mix complete spellings and abbreviations of units: "Wb/m^2" or "webers per square meter", not "webers/m^2". Spell out units when they appear in text: ". . . a few henries", not ". . . a few H".
- Use a zero before decimal points: "0.25", not ".25". Use "cm^3", not "cc".)

C. Equations

Number equations consecutively. To make your equations more compact, you may use the solidus (/), the exp function, or appropriate exponents. Italicize Roman symbols for quantities and variables, but not Greek symbols. Use a long dash rather than a hyphen for a minus sign. Punctuate equations with commas or periods when they are part of a sentence, as in:

$$a + b = \gamma \tag{1}$$

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 . . ."

D. LaTeX-Specific Advice

Please use "soft" (e.g., `\eqref{Eq}`) cross references instead of "hard" references (e.g., `(1)`). That will make it possible to combine sections, add equations, or change the order of figures or citations without having to go through the file line by line.

Please don't use the `{eqnarray}` equation environment. Use `{align}` or `{IEEEeqnarray}` instead. The `{eqnarray}` environment leaves unsightly spaces around relation symbols.

Please note that the `{subequations}` environment in LaTeX will increment the main equation counter even when there are no equation numbers displayed. If you forget that, you might write an article in which the equation numbers skip from (17) to (20), causing the copy editors to wonder if you've discovered a new method of counting.

BibTeX does not work by magic. It doesn't get the bibliographic data from thin air but from .bib files. If you use BibTeX to produce a bibliography you must send the .bib files.

LaTeX can't read your mind. If you assign the same label to a subsubsection and a table, you might find that Table I has been cross referenced as Table IV-B3.

LaTeX does not have precognitive abilities. If you put a `\label` command before the command that updates the counter it's supposed to be using, the label will pick up the last counter to be cross referenced instead. In particular, a `\label` command should not go before the caption of a figure or a table.

Do not use `\nonumber` inside the `{array}` environment. It will not stop equation numbers inside `{array}` (there won't be any anyway) and it might stop a wanted equation number in the surrounding equation.

E. Some Common Mistakes

- The word "data" is plural, not singular.
- The subscript for the permeability of vacuum μ_0, and other common scientific constants, is zero with subscript formatting, not a lowercase letter "o".
- In American English, commas, semicolons, 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).
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- 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].

F. Authors and Affiliations

The class file is designed for, but not limited to, six authors. A minimum of one author is required for all conference articles. Author names should be listed starting from left to right and then moving down to the next line. This is the author sequence that will be used in future citations and by indexing services. Names should not be listed in columns nor group by affiliation. Please keep your affiliations as succinct as possible (for example, do not differentiate among departments of the same organization).

G. Identify the Headings

Headings, or heads, are organizational devices that guide the reader through your paper. There are two types: component heads and text heads.

Component heads identify the different components of your paper and are not topically subordinate to each other. Examples include Acknowledgments and References and, for these, the correct style to use is "Heading 5". Use "figure caption" for your Figure captions, and "table head" for your table title. Run-in heads, such as "Abstract", will require you to apply a style (in this case, italic) in addition to the style provided by the drop down menu to differentiate the head from the text.

Text heads organize the topics on a relational, hierarchical basis. For example, the paper title is the primary text head because all subsequent material relates and elaborates on this one topic. If there are two or more sub-topics, the next level head (uppercase Roman numerals) should be used and, conversely, if there are not at least two sub-topics, then no subheads should be introduced.

H. Figures and Tables

a) 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. 3", even at the beginning of a sentence.

TABLE I
TABLE TYPE STYLES

Table Head	**Table Column Head**		
	Table column subhead	***Subhead***	***Subhead***
copy	More table copy[a]		

[a]Sample of a Table footnote.

Fig. 3. Example of a figure caption.

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".

IV. Discussion

V. Conclusion

Reconnaissance

The preferred spelling of the word "acknowledgment" in America is without an "e" after the "g". Avoid the stilted expression "one of us (R. B. G.) thanks ...". Instead, try "R. B. G. thanks...". Put sponsor acknowledgments in the unnumbered footnote on the first page.

References

Please number citations consecutively within brackets [1]. The sentence punctuation follows the bracket [2]. Refer simply to the reference number, as in [3]—do not use "Ref. [3]" or "reference [3]" except at the beginning of a sentence: "Reference [3] was the first ..."

Number footnotes separately in superscripts. Place the actual footnote at the bottom of the column in which it was cited. Do not put footnotes in the abstract or reference list. Use letters for table footnotes.

Unless there are six authors or more give all authors' names; do not use "et al.". Papers that have not been published, even if they have been submitted for publication, should be cited as "unpublished" [4]. Papers that have been accepted for publication should be cited as "in press" [5]. Capitalize only the first word in a paper title, except for proper nouns and element symbols.

For papers published in translation journals, please give the English citation first, followed by the original foreign-language citation [6].

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