form

One of the missions of the Hospital is to facilitate the application of the results of Hospital research to the benefit of society in partnership with other organizations, both for-profit and non-profit. The objective of the Technology and Innovation Development Office (TIDO) is to encourage researchers to describe novel ideas, inventions, or biological materials that may have medical, research, or commercial uses. The purpose of this Invention and Technology Disclosure is to record an invention and related circumstances and to serve as the basis for an evaluation by the TIDO of its patentability and potential for commercial application. It is an important, legal document and should be prepared carefully.

In the context of this disclosure form, an invention may be any process or material that is new and useful and may result when research yields unusual or unexpected results. To be patentable, an invention should not be obvious to others in the field, not be used by others previously, and not be described in a publication or presentation (in the U.S., one is allowed to file a patent application within one year after a public disclosure).

This form is available on paper and on line in Microsoft Word (PC or Macintosh format) and Adobe Acrobat PDF. Please fax, mail or email the completed form to the **Technology and Innovation Development Office, 1 Autumn St. [2nd Floor], 617-919-3019, fax (617) 919-3031,** TIDO@childrens.[harvard](mailto:tido@childrens.harvard.edu).edu.

For more information on how inventions are handled as well as how any proceeds from their commercialization are distributed, please review the Children’s Hospital Boston Policy on Inventions and Intellectual Property, a copy of which is available online or from the TIDO.

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| --- | --- | --- | --- | --- | --- |
| TIDO will complete this section | | | | | |
| **Date Received** |  | **CMCC No** |  | **Assoc**i**ate** |  |

### 1. Invention Title

Provide a brief title that is descriptive of the invention and its potential application

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| --- |
| **Low-powered frequency finder, developed for use with wearable heart rate monitor** |

### 2. Contributor(s)

Include the names, addresses, and affiliations of all likely contributors. A contributor is an individual who has conceived an essential part of the invention either independently or jointly, but not necessarily one who participated in the research related to the invention. Please note if any named individual has an appointment at an institution other than Children's.

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| Note: | Enter the principal contact information for this invention in the Contributor 1 section below. | | | | | | | | | | |
| Contributor 1 | | | **Kahn** | | **Jason** | | | |  | |  |
|  | | | **(last name)** | | **(first name)** | | | | **(MI)** | | **(degree[s])** |
| Position/Title | | |  | | | | | | | | |
| Institution | | |  | | | | Department | | Psychiatry | | |
| Office Mailing Address | | |  | | | | Email address: | |  | | |
| Phone/ Ext | | |  | | | | Fax | |  | | |
| Children’s Hospital ID | | |  | | | | Page/Beeper: | |  | | |
| Home Address | | |  | | | | City, State, Zip | |  | | |
| Country of Citizenship | | |  | | | | SS# | | Not needed | | |
| Describe the contribution made by individual 1 | | | | | | | | | | | |
| Developed the idea for the overall circuit design and the concept of using a wavelet transform-based algorithm for signal processing. | | | | | | | | | | | |
|  | | | | | | | | | | | |
| Contributor 2 | | **Bucchieri** | | **Marc** | | | | **I** | |  | |
|  | | **(last name)** | | **(first name)** | | | | **(MI)** | | **(degree[s])** | |
| Position/Title | | Intern | | | | | | | | | |
| Institution | |  | | | | Department | | Psychiatry | | | |
| Office Mailing Address | |  | | | | Email address: | | bucchierimarc@gmail.com | | | |
| Phone/ Ext | | 781-258-8074 | | | | Fax | |  | | | |
| Children’s Hospital ID | | 168925 | | | | Page/Beeper: | |  | | | |
| Home Address | | 65 Bromfield Rd | | | | City, State, Zip | | Somerville MA, 02144 | | | |
| Country of Citizenship | | USA | | | | SS# | | Not needed | | | |
| Describe the contribution made by individual 2 | | | | | | | | | | | |
| Developed a circuit to provide some filtering and signal processing, and programmed the algorithm for finding frequency. | | | | | | | | | | | |
|  | | | | | | | | | | | |
| Contributor 3 | | | **Miaoulis** | | **Katrina** | | | |  | |  |
|  | | | **(last name)** | | **(first name)** | | | | **(MI)** | | **(degree[s])** |
| Position/Title | | | Intern | | | | | | | | |
| Institution | | |  | | | | Department | | Psychiatry | | |
| Office Mailing Address | | |  | | | | Email address: | |  | | |
| Phone/ Ext | | |  | | | | Fax | |  | | |
| Children’s Hospital ID | | |  | | | | Page/Beeper: | |  | | |
| Home Address | | |  | | | | City, State, Zip | |  | | |
| Country of Citizenship | | |  | | | | SS# | | Not needed | | |
| Describe the contribution made by individual 3 | | | | | | | | | | | |
|  | | | | | | | | | | | |
|  | | | | | | | | | | | |
| Contributor 4 | | |  | |  | | | |  | |  |
|  | | | **(last name)** | | **(first name)** | | | | **(MI)** | | **(degree[s])** |
| Position/Title | | |  | | | | | | | | |
| Institution | | |  | | | | Department | |  | | |
| Office Mailing Address | | |  | | | | Email address: | |  | | |
| Phone/ Ext | | |  | | | | Fax | |  | | |
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| Home Address | | |  | | | | City, State, Zip | |  | | |
| Country of Citizenship | | |  | | | | SS# | | Not needed | | |
| Describe the contribution made by individual 4 | | | | | | | | | | | |
|  | | | | | | | | | | | |
|  | | | | | | | | | | | |
| Contributor 5 | | |  | |  | | | |  | |  |
|  | | | **(last name)** | | **(first name)** | | | | **(MI)** | | **(degree[s])** |
| Position/Title | | |  | | | | | | | | |
| Institution | | |  | | | | Department | |  | | |
| Office Mailing Address | | |  | | | | Email address: | |  | | |
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| Children’s Hospital ID | | |  | | | | Page/Beeper: | |  | | |
| Home Address | | |  | | | | City, State, Zip | |  | | |
| Country of Citizenship | | |  | | | | SS# | | Not needed | | |
| Describe the contribution made by individual 5 | | | | | | | | | | | |
|  | | | | | | | | | | | |

To assign contributor status to more than five individuals, contact the Technology and Innovation Development Office TEL (617) 919-3019 | FAX (617) 919-3031 | email [TIDO@childrens.harvard.edu](mailto:TIDO@childrens.harvard.edu) to request a Supplemental Contributors form.

### 3. Sponsors

Give the name of the organization and grant numbers that provided any funding for yourself, others, and the research that lead to the invention (at other institutions if applicable).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Organization |  | | Grant No. | |  | | |
| Organization |  | | Grant No. | |  | | |
|  | | |  |  | |  |  |
| Was any of the funding from another institution? | | |  | **Yes** | |  | **No** |
| If yes, name | |  | | | | | |
|  | | |  |  | |  |  |
| Were biological materials from another institution used? | | |  | **Yes** | |  | **No** |
| If yes, what materials from where? | |  | | | | | |

### 4. Assignment Statement and Signatures:

***All contributors must read and sign this section.***

|  |  |
| --- | --- |
| I/We agree to assign all right, title, and interest to this invention and any subsequent patent applications to Children's Medical Center Corporation in accordance with the terms of my appointment and/or employment at the Hospital and with its policies: | |
| Contributor Signature | Date |
| Contributor Signature | Date |
| Contributor Signature | Date |
| Contributor Signature | Date |
| Contributor Signature | Date |

### 5. Witness Statement:

Arrange for a witness to sign who has read and understood the disclosure; the witness may be a member of the TIDO staff.

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| This invention was disclosed to and understood by me: | | |
| Witness Name |  | Phone |
| Witness Signature |  | Date |

### 6. Invention Description

Describe what the invention is and what it does, e.g., its general purpose, primary applications, technical details, advantages or improvements over existing methods or materials, patents or publications by others that may be similar. You may attach or insert an abstract from a manuscript, presentation, publication, or grant application and/or attach supporting materials, for example, drawings, tables, and figures.

If additional materials are submitted, check here

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| Our invention is effectively an electric and computational method for reliably finding frequencies in the 0.5 – 3 Hz range, while using very low electrical and processing power. The accuracy for these reading is quite good (+/- .05 Hz) and the same technique may be diversifiable to other parts of the frequency spectrum. The original device was designed to find heart rate and uses a signal in the 0-5V range and a program running on an Arduino Uno (8-bit 16MHz ATmega328 CPU, 32 Kb Flash memory and 2 Kb of RAM), a low-resource general computing environment. The same algorithm could be deployed on more special-purpose components to achieve reduction in physical size and power requirements of a biosensing device. |
| What or who is a source of information on existing technology (e.g., reference books, colleagues, contacts in companies) to help us evaluate the advantages of your invention? |
| Our circuit was roughly based on the open source design at <http://embedded-lab.com/blog/?p=5508>. However this circuit alone does not effectively discretize the frequency or present it in a form available for computational processing/ storage. Many existing biosensors employ frequency finders, most notably commercial heart rate monitors. |

### 7. Commercial Interest:

Has anyone from a company expressed an interest in the invention or research related to the invention? Provide the names (if possible) of individuals or companies who have been or may be interested.

|  |
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| The commercial applications of this method are widespread in the health and biotechnology markets. The original heart rate monitor application is itself valuable, and more refined uses of this algorithm could be developed to sense heart rate variability, respiration rate, and other oscillating biological functions. In any application, this design should retain its advantage of using minimal materials, a low power source, and very little computational power or memory. |

### 8. Conception and Disclosure to Others:

Accurate dates are important and may affect the likelihood of obtaining a patent. When was the invention conceived? Has or will the invention be described (disclosed) outside the Hospital (e.g., in a poster session, publication, thesis, or grant application) or was any material associated with it transferred to others outside the Hospital?

|  |  |  |
| --- | --- | --- |
| Date of Conception | July 1, 2014 | |
| Is this date documented? | No | If yes, where? |
| Date and name of first publication containing sufficient description to enable someone to make or use the invention. Attach publication and check here: | | |
|  | | |
| Date and location of first public oral disclosure containing a sufficiently enabling description. Abstract attached: | | |
|  | | |
| If undisclosed as of now, please provide the date of the anticipated publication or oral disclosure and the name of the periodical or conference to which the description was or will be submitted. Publication or abstract attached: | | |
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