Windmill

System Design Document

Version 1.0

24/11/2021

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1. Introduction

Today's subject is to build windmill and get it to work. You need to little bit do some designing what kind of windmill you will do and print it with 3D-printer. You need to code the machine and find compatible parts to mill. You need to know something about the electricity before you even start. In this document you will find all the parts when you scroll down and another information. There is a couple site where have gathered all information you will need to build this windmill. So, when you start go there if you need help.

1.1 Purpose of the SDD

Purpose of project is electricity generator. Machine gets electricity and starts spinning. When wings spin, that movement collects electricity. Then you can use it and you don't need another electricity source.

2. General Overview and Design Guidelines/Approach

2.1 General Overview

Windmill can use in future on a larger scale. You can produce electricity and save it for later. If there isn't example water, you can't use watermill. But you can use windmill almost everywhere. Of course, the higher the better. Design is just white, and appearance is just simple and basic.

2.2 Assumptions/Constraints/Risks

2.2.1 Assumptions

Need to assumption that everything works as should.

2.2.2 Constraints

There aren't many risks within this project but there is still a few. If code fails, it does nothing. But when you are dealing with shield or circuits, that's a different thing.

When circuit is alone, you should be fine, but since it comes electricity, you should think. If you do something wrong, you could get electric shock or worse. Always check the wires and know, what are doing.

When you are working with shield, in one process you need use chemicals. So, know what are doing and make research how to use those chemicals.

2.3 Alignment with Federal Enterprise Architecture

Not Applicable

3. Design Considerations

In the project needs to get done almost everything when it's finally complete. Need to write the code down and get connection between boards. Without shield it can be done otherwise not.

3.1 Goals and Guidelines

To first sprint our goal is to get windmill work with cable. To second sprint our goal is to get windmill work with wirelessly. There are few other goals like get our hall sensor to work with magnets and get results to bar display. But the only goal is that the windmill works, and it isn't broken or defective.

3.2 Development Methods & Contingencies

First need to check that windmill parts are compatible to each other. Then another part like motor needs to fit in windmill. Code needs to be written like so that it works in both boards, and they can communicate.

3.3 Architectural Strategies

Not applicable

3.4 Performance Engineering

Not applicable

4. System Architecture and Architecture Design

There are three boards: one master board and two slave boards. In every board there is a code inside them and top of them is part which can both transmitter and receiver. They get electricity from somewhere example computer. One slave has hall sensor and few resistors because it needs voltage divider. And then there's the windmill which needs the boards.

4.1 Logical View

All the materials are in internet. Nucleo L432KC Board and Nucleo F429ZI-DISCOVERY Board source codes are in site called GitHub. Rest of the information of project are in Azure Devops.

4.2 Hardware Architecture

Not applicable

4.2.1 Security Hardware Architecture

Not applicable

4.2.2 Performance Hardware Architecture

Hall effect sensor: Sensor what detect magnet surfaces. In board it detects magnet which is attached to windmills wing.

MAX348: It is little communication system in board which communicates with RF- signals. There is three of them and in every board. With right code they can communicate each other. One part sends information to other parts.

Nucleo F429ZI-DISCOVERY Board: Master board

Nucleo L432KC Board: First slave node which is attached to windmill. It gets first information which it sends to forward.

L152RE board: Second slave node. Last board in communication line.

4.3 Software Architecture

Code needs to be the right kind that it will work inside the boards

4.3.1 Security Software Architecture

Not applicable

4.3.2 Performance Software Architecture

Not applicable

4.4 Information Architecture

Not applicable

4.4.1 Records Management

Not Applicable

4.4.1.1 Data

Documents and other material of project is in GitHub and Azure Devops

4.4.1.2 Manual/Electronic Inputs

Inputs are taking code forward to other parts.

4.4.1.3 Master Files

Most important files are code to both boards. Then are datasheets to parts and finally pictures of windmill how to make one with 3D-printer. All these can find in GitHub and Azure Devops.

4.5 Internal Communications Architecture

Not applicable

4.6 Security Architecture

Documents and other material of project is in GitHub and Azure Devops.

4.7 Performance

Documents and other material of project is in GitHub and Azure Devops.

4.8 System Architecture Diagram

Not applicable

5. System Design

5.1 Business Requirements

Documents and other material of project is in GitHub and Azure Devops.

5.2 Database Design

Not applicable

5.2.1 Data Objects and Resultant Data Structures

Slave board gives the data to master board and master board shows the data in display. And hall sensor which is attached to slave is creating those results to slave.

5.2.2 File and Database Structures

Not applicable

5.2.2.1 Database Management System Files

Not Applicable

5.2.2.2 Non-Database Management System Files

Not applicable

5.3 Data Conversion

Documents and other material of project is in GitHub and Azure Devops.

5.4 User Machine-Readable Interface

There are three roles in this windmill: master board, slave board and machine itself. Master board communicates with slave board and slave answers back. When they communicate, the machine stars working.

5.4.1 Inputs

You can read more about those inputs from the code in GitHub.

5.4.2 Outputs

You can read more about those outputs from the code in GitHub.

5.5 User Interface Design

Documents and other material of project is in GitHub and Azure Devops.

5.5.1 Section 508 Compliance

Documents and other material of project is in GitHub and Azure Devops.

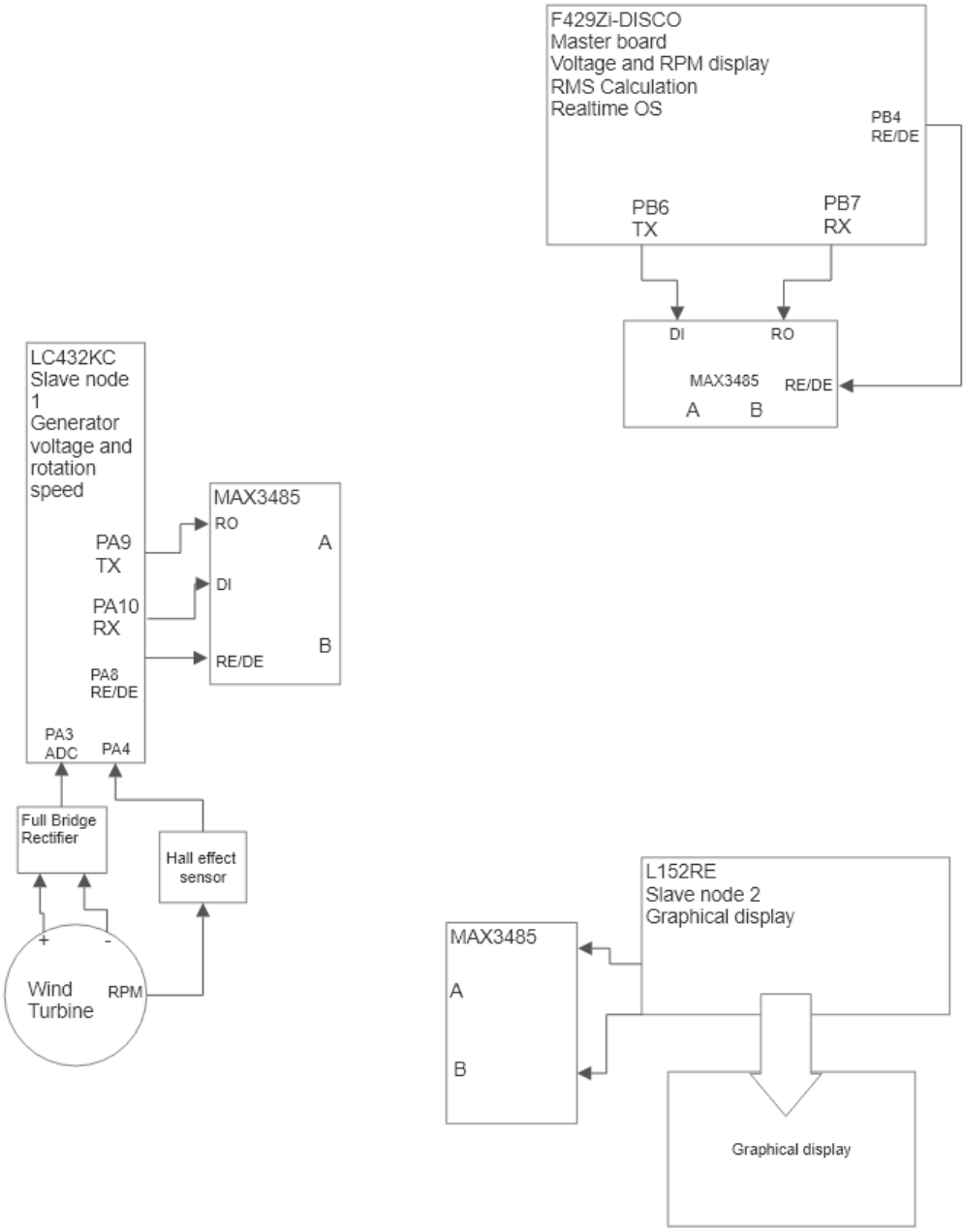
6. Operational Scenarios

It is very easy and simple from users' perspective. When windmill is ready to use, just give the wings some air and they should start spinning. Then read the results from Nucleo F429ZI-DISCOVERY board. Code is running in the boards; wires transports data and resistors checks that nothing is overloaded.

7. Detailed Design

Team needs a few coding classes to understand the code and produce it. They need knowledge to understand hardware and components. There are many components, so team needs to know their pins and in general know what the component is. It isn't enough, that the component just looks right. It needs to be right. Also, team need to understand what electricity is. It sounds easy and simple, but there are still few nice things to know about.

7.1 Hardware Detailed Design



7.2 Software Detailed Design

Documents and other material of project is in GitHub and Azure.

7.3 Security Detailed Design

Not applicable

7.4 Performance Detailed Design

Not applicable

7.5 Internal Communications Detailed Design

The project had to be part, where master board communicates with slave boards. But timeline come against, so it had to drop out. That part was MAX3485.

8. System Integrity Controls

Not Applicable

9. External Interfaces

There are not any external interfaces.

1.1 Interface Architecture

Not Applicable

1.2 Interface Detailed Design.

Not Applicable

Appendix A: Record of Changes

Table 1 - Record of Changes

Version Number	Date	Author/Owner	Description of Change
<X.X>	*<MM/DD/YYYY>*	*CMS*	*<Description of Change>*
<X.X>	*<MM/DD/YYYY>*	*CMS*	*<Description of Change>*
<X.X>	*<MM/DD/YYYY>*	*CMS*	*<Description of Change>*

Not Applicable

Appendix B: Acronyms

Table 2 - Acronyms

Acronym	Literal Translation
<Acronym>	*<Literal Translation>*
<Acronym>	*<Literal Translation>*
<Acronym>	*<Literal Translation>*

Not Applicable

Appendix C: Glossary

Table 3 - Glossary

Term	Acronym	Definition
<Term>	*<Acronym>*	*<Definition>*
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<Term>	*<Acronym>*	*<Definition>*

Not Applicable

Appendix D: Referenced Documents

Table 4 - Referenced Documents

Document Name	Document Location and/or URL	Issuance Date
<Document Name>	*<Document Location and/or URL>*	*<MM/DD/YYYY>*
<Document Name>	*<Document Location and/or URL>*	*<MM/DD/YYYY>*
<Document Name>	*<Document Location and/or URL>*	*<MM/DD/YYYY>*

Not Applicable

Appendix E: Approvals

The undersigned acknowledge that they have reviewed the SDD and agree with the information presented within this document. Changes to this SDD will be coordinated with, and approved by, the undersigned, or their designated representatives.

Table 5 - Approvals

Document Approved By	Date Approved
Name: <Name>, <Job Title> - <Company>	Date
Name: <Name>, <Job Title> - <Company>	Date
Name: <Name>, <Job Title> - <Company>	Date
Name: <Name>, <Job Title> - <Company>	Date

Not Applicable

Appendix F: Additional Appendices

Not Applicable