*Projects and Stuff*

Pong.0

Requirements

Contents

[1 INTRODUCTION 4](#_Toc365815800)

[1. REQUIREMENTS OVERVIEW 4](#_Toc365815801)

[1.1 Project Objectives 4](#_Toc365815802)

[1.2 Assumptions/Constraints 4](#_Toc365815803)

[1.3 System Scope 4](#_Toc365815804)

[1.4 Past and Related Work (optional) 5](#_Toc365815805)

[1.5 Risks 5](#_Toc365815806)

[1.6 Deliverables produced 5](#_Toc365815807)

[1.7 End Users 6](#_Toc365815808)

[1.8 Estimated Effort/Cost/Duration 6](#_Toc365815809)

[2 FUNCTIONAL REQUIREMENTS 6](#_Toc365815810)

[2.1 <Functional Requirements Group 1> 7](#_Toc365815811)

[2.2 <Functional Requirements Group 2> 7](#_Toc365815812)

[3 NON-FUNCTIONAL REQUIREMENTS 7](#_Toc365815813)

[3.1 Design Constraints 7](#_Toc365815814)

[3.2 Equipment and Tools Used 7](#_Toc365815815)

[3.3 Hardware Requirements 7](#_Toc365815816)

[3.4 Software Requirements 7](#_Toc365815817)

[3.5 Performance Requirements 8](#_Toc365815818)

[3.6 Reliability Requirements 8](#_Toc365815819)

[3.7 Supportability Requirements 8](#_Toc365815820)

[3.8 User Documentation Requirements 8](#_Toc365815821)

[3.9 Interface Requirements 8](#_Toc365815822)

[3.10 Security and Privacy Requirements 8](#_Toc365815823)

[3.11 Data Requirements 8](#_Toc365815824)

[3.12 Compliance and Standards Requirements 9](#_Toc365815825)

[4 BUSINESS PROCESS MODEL 9](#_Toc365815826)

[5 LOGICAL DATA MODEL 9](#_Toc365815827)

[6 REQUIREMENTS TRACEABILITY MATRIX 9](#_Toc365815828)

[7 APPENDIX A: REQUIREMENTS DEFINITION APPROVAL 9](#_Toc365815829)

[8 APPENDIX B: REFERENCES 9](#_Toc365815830)

[9 APPENDIX C: BUSINESS PROCESS MODEL 9](#_Toc365815831)

[10 APPENDIX D: LOGICAL DATA MODEL 9](#_Toc365815832)

[11 APPENDIX E: REQUIREMENTS TRACEABILITY MATRIX 9](#_Toc365815833)

[12 ACRONYMS AND ABBREVIATIONS 9](#_Toc365815834)

1. INTRODUCTION
2. REQUIREMENTS OVERVIEW

*[Describe here the business requirements that the project work will fulfill and how and/or where the completed project product will fit into any existing systems. Business requirements can often be described as ‘features.’ Assign a unique ID number to each requirement.]*

* 1. Project Objectives

*[Objectives are statements that describe “WHAT” this project will achieve and deliver. Objectives should be achievable, realistic, specific, measurable, and include time objectives. All objectives should be deliverable-based with specific key milestones indicated. The completion of an objective should be evident through the creation of one or more deliverables. If the statement is at a high level and does not imply the creation of a deliverable, it may be a goal instead. If the statement is too low-level and describes “HOW” to accomplish a goal, then it may be Functional Specification or Design material and inappropriate in this document. (Please remove this comment section from the final document.)]*

* 1. Assumptions/Constraints

*[Describe any overall assumptions / constraints related to project requirements*

*Project assumptions are circumstances and events that need to occur for the project to be successful, but are outside the total control of the project team. They should be listed as assumptions if there is a HIGH probability that they will happen. The assumptions provide a historical perspective when evaluating the project performance and determining justification for project-related decisions and direction. This information may simply be included in other sections of this document if the assumption is directly related to that section. If assumptions are generic in nature they should be included here. If there are no generic assumptions, you may delete this section entirely. (Please remove this comment section from the final document.)]*

* 1. System Scope

*[Describe the features, users, and interfaced systems. Include a context diagram if appropriate. Assign a unique ID number to each requirement.*

*Scope statements are used to define both what is within and what is outside the boundaries of the project. Examples of areas that could be included are applications, data, processes or business areas. The following types of information are usually helpful:*

* *The types of deliverables that are to be included and those deliverables which are NOT to be included.*
* *The types of data that are part of the project or not. (financial, sales, employee data, etc.)*
* *The data sources (or databases) that are to be accessed and whether there are Application Program Interfaces (API’s) currently available. (Billing, General Ledger, Payroll)*
* *The major life-cycle processes that are included or not (analysis, design, testing)*
* *The major functionality that is in scope and out of scope (decision support, data entry, management reporting)*
* *The specific operating systems, application software and the version number for each. (MS Windows XP, version 1.0, etc.)]*
  1. Past and Related Work (optional)

*[Provide concise information on the focus of previous projects or activities that are active (or have been) within the sector and/or related to the project being implemented. If the proposed project is expected to interact with other projects, define the mechanisms for coordination and information sharing to ensure complementarity and build sustainable partnerships for lasting impact.]*

**Chameleon**

Chameleon is a similar project which was designed specifically to be a precursor for Pong.0. It is a single-sensor beverage coaster which lights up when a cup containing liquid is placed on it.

Similarities

Uses Atmel’s QTouch library

Uses the QMatrix method of sensor polling

Makes us of the same type of RGB LEDs

Differences

Chameleon makes use of AVR ATTiny microcontroller, rather than AVR XMega

Uses different LED driver

During the development of Chameleon, I learned an incredible amount of information:

* Effectively implementing LED drivers into a design
* Battery management with USB
* Using Atmel’s QMatrix Technology
  1. Risks

*[Risks are circumstances or events that exist outside of the control of the project team that may have an adverse impact on the project should they occur. (In other words, whereas an issue is a current problem that must be dealt with, a risk is a potential future problem that has not yet occurred.) All projects contain some risks. It may not be possible to eliminate risks entirely, but they can be anticipated and managed, thereby reducing the probability that they will occur.*

*Risks that have a high probability of occurring and have a high negative impact should be listed first below. Also consider those risks that have a medium probability of occurring. For each risk listed, identify activities to perform to eliminate or mitigate the risk.]*

**Risk**: I get deployed during the production phase

**Probability**: Possible

**Impact**: Severe

**Mitigation**: The best methods of mitigating this risk include finding a suitable drop-shipping company, or even better, finding a partner for this venture.

**Risk**: The project funding is unsuccessful

**Probability**: Possible

**Impact**: Only impact is that the amount of money and time spent of prototyping and marketing will have been somewhat wasted. The resulting experience will still be valuable.

**Mitigation**: Be sure to look at lessons learned from successful and unsuccessful crowdfunding ventures. Be sure to engage my entire network of family, friends, coworkers and acquaintances.

* 1. Deliverables produced

*[In this section, describe the project deliverables. Provide enough explanation and detail so that someone not familiar with the project will know what you want and will be able to understand what to produce. Include the hardware and software environment on which the application(s) will reside. List specific data elements to use or capture. Most of these items are usually easily measurable and have definitive completion indicators which make it easy to track progress of the project.]*

The final manufactured product will include:

* One set of two Pong.0 Modules
* Two USB-A to USB Micro-B Cables
* One printed user manual
* CD with SDK and User Manual?
  1. End Users

*[Who will be the end-user or beneficiary of this project?*

*Identify the stakeholders (agencies, organizations, groups or individuals) which have a direct or indirect interest in the project. Identify the target beneficiaries (groups or individuals) for whom the project is being undertaken. Project planning, development and implementation should be done in a participatory and gender-sensitive manner with the stakeholders and target beneficiaries, including, whenever possible, local representatives of potential donors.]*

* 1. Estimated Effort/Cost/Duration

*[We will fill in this section from the standpoint of our services. However, you may find that it is helpful to estimate your effort hours and project costs from your company’s standpoint. This will alert your top executives regarding the time which your company will apply to make this project happen. It’s also a good way to make sure they understand how busy you’ll be. This may be depicted in many different ways: cost by team member, cost by deliverable, cost by milestone, or cost by category (internal labor, travel, training, supplies, etc.). Also include a chart showing the anticipated project start date, major milestones, and end date. The deliverables included in this milestone chart should all have been previously described in the Scope section. With respect to milestone dates, please expect that these may need to be revised after the Functional Specification which we provide is completed. (Please remove this comment section from the final document.)]*

Costs:

* Components (including battery)
* PCB Manufacture and Assembly ([**Seeed Studio**](http://www.seeedstudio.com/service), [**ITead Studio**](http://imall.iteadstudio.com/open-pcb/pcb-prototyping.html), [**Tinysine**](http://www.tinyosshop.com), or [**Smart-Prototyping**](http://smart-prototyping.com/))
* Enclosure
* Cables
* Printing
* Graphic Design
* Shipping (parts and assemblies to me)
* Shipping to customer

The cost for this project is higher than for many other products, simply because the printed circuit board required is so large.

Estimated cost:

Estimated effort hours:

Estimated duration:

1. FUNCTIONAL REQUIREMENTS

*[Functional requirements capture and specify intended behavior of the system being developed. They define things such as system calculations, data manipulation and processing, user interface and interaction with the application, and other specific functionality that show how user requirements are satisfied. Assign a unique ID number to each requirement.*

*The functional requirements are grouped according to the project’s needs, and maybe influenced by the requirements tools and techniques used. ]*

* 1. <Functional Requirements Group 1>
  2. <Functional Requirements Group 2>

1. NON-FUNCTIONAL REQUIREMENTS

*[Describe the existing non-functional (also referred to as Quality of Service by the International Institute of Business Analysts, Business Analysis Body of Knowledge), technical environment, systems, functions, and processes. Include an overview of the non-functional requirements necessary to achieve the project’s objectives.]*

* 1. Design Constraints

*[Describe hardware/software requirements that will limit the design or COTS options. These may include laws, regulations, hardware limitations, interfaces, development environment, operational environment, criticality, safety, and/or security. Assign a unique ID number to each requirement.]*

* 1. Equipment and Tools Used

*[Describe the software tools, equipment, test equipment, and other tools that will be used to develop this project.]*

Hardware Development Resources: KiCad EDA

Hardware Prototype Programming Resources:

Firmware Development Resources: Atmel Studio 6

Test Equipment: Saleae Logic (on hand), Oscilloscope (on hand), Spectrum Analyzer (borrow)

* 1. Hardware Requirements

*[Describe hardware requirements and any related processes. Include a detailed description of specific hardware requirements and associate them to specific project functionality/deliverables. Include information such as type of hardware, brand name, specifications, size, security, etc. Assign a unique ID number to each requirement.]*

Hardware Development – PCB

CAD/EDA: [**KiCad EDA**](http://www.kicad-pcb.org) (Open Source EDA)

Hardware Development – Enclosure

CAD: [**FreeCad**](http://www.freecadweb.org)(Open Source 3D Parametric CAD)

The hardware will consist of several parts:

* Enclosure
* Printed Circuit Board (PCB)
* Battery

The case should be less than 1 inch in thickness. The thinner the better. It will be made of a transparent or semi-transparent plastic. It needs to be designed in such a way that water, beer, and other liquids do not penetrate to the battery and electronics inside, yet it must also provide access to a USB port for charging. Use of a water-resistant USB port is required. The prototype enclosure may be machined, but production enclosures should be moulded. This will be a high up-front cost, but for production quantities, it should become reasonable. (INCLUDE SOME CALCULATIONS AND COST/BENEFITS HERE)

The printed circuit board will need to be large enough to accommodate either a 6-cup game or a 10-cup game. It will also require enough space at the front edge for a 2.4 GHz printed antenna for wireless communication between devices. The average diameter of the cups to be used is 3.75 inches, but the base of the cup, which is approximately 2.50 inches in diameter, is all that is required for the actual sensing. This means that the measurements for the board should take into considerations that the diameter of the top of the cup doesn’t need to be used for the cups along the edges of the board.

The battery must meet certain dimensional requirements to match the general shape of the game and the enclosure. A long and slender battery is ideal.

* 1. Software Requirements

*[Describe software requirements and any related processes. Include a detailed description of specific software requirements and associate them to specific project functionality/deliverables. Include information such as in-house development or purchasing, security, coding language, version numbering, functionality, data, interface requirements, brand name, specifications, etc. Assign a unique ID number to each requirement.]*

Firmware Development

IDE: Atmel Studio 6.1

Language: C (using the AVRGCC Toolset)

Software Libraries Used: QTouch Library

* 1. Performance Requirements

*[Describe performance requirements and any related processes. Include a detailed description of specific performance requirements and associate them to specific project functionality/deliverables. Include information such as system capacity, cycle time, speed per transaction, test requirements, minimum bug counts, speed, reliability, utilization etc. Assign a unique ID number to each requirement.]*

* 1. Reliability Requirements

*[Describe all of the technical requirements that affect availability such as hours of operation, level of availability required, down-time impact, support availability, accuracy, etc. Assign a unique ID number to each requirement.]*

Battery usage time: How long will a particular battery, starting from a full charge, last for?

Battery charge time: How long will it take to charge the battery? This will require a trade-off with the battery capacity.

Battery lifespan: How many charge cycles will the battery provide?

Capacitive sensor calibration: The capacitive sensors will need to remain calibrated (or be re-calibrated in some automated way) throughout the course of play. This may be a long period of time.

* 1. Supportability Requirements

*[Describe all of the technical requirements that affect supportability and maintainability such as coding standards, naming CONVENTIONS; maintenance access, required utilities, etc. Assign a unique ID number to each requirement.]*

* 1. User Documentation Requirements

*[Describe the requirements, for any special or on-line user documentation or help systems, etc. Assign a unique ID number to each requirement.]*

Because this will be a crowdfunded project, solid documentation is key to overall project success. The following documentation will be generated:

* This Requirements document
* A Project Log detailing all aspects of project development by date
* A paper/PDF User Manual
* Online documentation of the specifications and technical details for the project
  1. Interface Requirements

*[Describe all of the user interface (such as user navigation, presentation of application and associated functionality, screen location of interface elements, data display and manipulation, etc), system interface, and technical (hardware and software) requirements that affect interfaces such as look-and-feel, protocol management, scheduling, directory services, broadcasts, message types, error and buffer management, security, etc. Assign a unique ID number to each requirement.]*

Physical Interface:

USB Interface: The project will make use of a USB Bootloader, which will allow-end-users to update the system firmware via USB. At this time, I’m not sure if Atmel provides the capability for custom program for uploading the firmware to the XMega, or if I’ll have to use their tool.

* 1. Security and Privacy Requirements

*[Summarize and make reference to Privacy Impact Assessment produced during Planning phase and its impact on security requirements. Provide justifications for why a specific privacy item is needed. Provide Security Categorization if available.*

*Describe all of the technical requirements that affect security such as security audits, cryptography, user data, system identification/authentication, resource utilization, facility access times, etc. Assign a unique ID number to each requirement.]*

* 1. Safety Requirements

Battery: The battery cannot be allowed to be subjected to contact with or immersion in liquids. The enclosure should be specifically designed to incorporate methods of preventing liquid intrusion from occurring.

USB Port: The USB Port connector will be a water resistant design. To prevent users from trying to play while the device is plugged in and charging, no game play will be allowed while USB is plugged in, whether to a charger or to a computer. It might be beneficial to incorporate a special debugging mode where this safety requirement is overridden for testing and development.

* 1. Data Requirements

*[Describe data requirements and any related processes. Include detailed description of the logical database design, data characteristics and categorization (static, dynamic input, dynamic output, and internally generated), data constraints, data retention, scales of measurement, and frequency of updating and processing. In addition, describe the handling of data (source of input, input and output medium/device, recipient, collection procedures, error handling, and security.]*

* 1. Compliance and Standards Requirements

*[Describe the existing compliance environment as it affects project requirements, and the standards the system development must follow. Include an overview of the compliance or standards requirements necessary to achieve the project’s objectives. List all that are applicable to the project. Assign a unique ID number to each requirement.]*

1. BUSINESS PROCESS MODEL
2. LOGICAL DATA MODEL
3. REQUIREMENTS TRACEABILITY MATRIX
4. APPENDIX A: REQUIREMENTS DEFINITION APPROVAL
5. APPENDIX B: REFERENCES
6. APPENDIX C: BUSINESS PROCESS MODEL
7. APPENDIX D: LOGICAL DATA MODEL
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9. ACRONYMS AND ABBREVIATIONS