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| IMAGE pROCESSING: Final Report  Revised 05.01.2014 | LAUDED llamas  Simbarashe Musarurwa Kistel Hazel Danya Bynoe Matthew Aaron Michael Grayson  Software Engineering  CMPS 4113 |

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FINAL REPORT

# Description

The Lauded Llamas were tasked with solving the problem of droplet image processing. Dr. Ok, a professor from the Mechanical Engineering Department needed a program that would combine the functionality of three different pieces of software; Optimus, Matlab and Excel. Our goal was to develop as user friendly, fast, efficient program that processed and analyzed images of a droplet bouncing on a ratchet surface. The centroid, velocity and acceleration were determined by the program and the values were output to a CSV file.

# Product Analysis

The final product met the basic specifications set by the user. The software currently:

* 1. Determines the location of the needle and the ratchet surface.
  2. Processes the base image and compares all subsequent images to the base image
  3. Allows the user to adjust the conversion of base image to black and white
  4. Allows the user to select the base image and the droplet images to be processed
  5. Calculates the centroid, velocity and the acceleration and outputs results to CSV file
  6. Has a user friendly GUI
  7. Runs five times faster than Optimus and produces more accurate results

The software could further be improved by doing the following:

1. Allowing the user to name the CSV file.
2. Providing a help button in the program.
3. Letting the user view what a button does by hovering above it
4. Saving the processed images in a new folder that the user will have access to.
5. Letting the user give the length and height of the field of view so that calculations will not be relative to the number of pixels.
6. Including a macro in the output so that graphs would be automatically created in EXCEL
7. Threading the program to increase time

# Deviations

There were some deviations from the requirements and specifications document and the project plan. The deviations are listed below:

* 1. Language switched from C++ to C#
  2. The user no longer needs to define the needle and the surface instead it is defined by the program.
  3. Some dates got pushed back and shifted up in the project plan.
  4. The initial design was not followed exactly because of the language change.

# Team Organization

Simbarashe Musaruwra was our decentralized leader, he was the point of contact for the customer. The code leader was Michael Grayson and he and Simba met frequently with Dr. Ok (Matt, Kistel and Danya would join periodically). We decided to use the agile process after our initial meeting with the customer since he desired to be greatly involved. Agile meetings were straight and to the point and enabled us all to solve implementation problems as well as tackle the changing requirements. Extreme Programming was also used at some times and proved to be very successful in solving difficult implementation problems. We all felt comfortable as a group to communicate our problems and issues to each other. This enabled us to solve problems faster. As a team we tried to determine each member’s strength and utilize it for the success of the project. This approach proved successful as we all contributed to the project equally. All members of the Lauded Llamas worked well within the selected team structure and the chosen software development life cycle

# Team Experience

As a team we learned some very important things. We all determined that we had learned the following:

* 1. Communication is important between the client and the team and also between team members. Working with more than one person makes miscommunication easier. Group messaging tools like emails and texts are very helpful in eliminating some of that.
  2. The plan never works. We did not stick to our original plan though it did help. However, with ever changing requirements plans had to change
  3. Compromise is important with the customer. It is important to communicate what can be expected from the project to the customer. It is also important in choosing the right language for the project.
  4. How to be assertive in our code choice and portray ourselves as experts in the field.

The following comment are more specific to each team member. Each team member has written their thoughts on what was learned what he or she would have changed.

Simbarashe:

*Overall the project was a good experience and shed light on what benefits can be had when the correct process is chosen for a specific software engineering problem. There were some issues that I had with the project partly because the project had some deviations from our original project plan and some of the projected times we had made for certain aspects of the project. It is now clear though that no matter how well a project is planned it will never follow every single detail of the plan and as a result the team just needs to be prepared for when requirements, deadlines, etc. are changed by either the client or by other members of the team. The biggest change I would commit to our project if it could be done again would be changing the language that we chose in the beginning, it would have saved us well over a month of development time and left us plenty of time to do some Gold plating to our project. Also the use of Agile was probably the best decision made during the whole project because it helped us maintain a great deal of flexibility which was helpful because at times the client’s requirements changed weekly upon discovering what our progress had been for the previous week. All in all the quality of the product is reflective of how well the process worked and how well the members of the team were able to carry out each of their designated tasks, and as such the final products and its completion are a reflection of how good the team has been and how good their work has been.*

Michael:

*Working on a team for a software development project has been a new experience for me. All of my other C.S. projects were either individually or working with only one or two other colleagues. Our team was very well-structured and worked together efficiently as a group. I believe that by choosing an agile process the experience from this class will carry over to a real world application or environment. Also, from an individual standpoint, learning C# is the most useful application that I have taken away from this experience.*

Matthew:

*What I learned from this experience is*

* *What to expect in a software engineering career*
* *It's hard to avoid miscommunication*
* *There are always going to be test cases you haven't think of yet*

*Things I would change if we had to do it all over again:*

*I would've taken only my minimum number of credit hours this semester. Then there would've been less times when I felt like I had to choose between doing other assignments in a hurry so I could do my share of the work in this project well or vice versa, and thus we probably would have finished slightly sooner or at least not had so much to do in the last minute. Similarly, I would have tried to take more initiative earlier on for the same reason.*

Kistel:

*The Agile life cycle was well suited to our project. I wish we would have been better communicators to Dr. Ok so we could all be on the same page from the beginning. If I could do it again I would take a lighter course load so I could have more time to devote to the project. I also wish we had chosen C# earlier so that we could improve the program.*

Danya

*This experience has taught me numerous things and has opened my eyes. It is important to choose the right language for a project. It saves time even if a new language has to be learned. Planning is important even if as you go along the requirements and deadlines may change, having a guide is a big help. Documentation is necessary but also difficult and testing never ends. It was my first time working with so many people on one project. I am happy for the experience it was a good one. If I could do it again I would choose the language earlier and communicate better with the client. I would also suggest that we thread the program so that it could run even faster.*