What a project report should contain

Carsten Wulff, *2021-10-24*, v0.1.0

Abstract—**The abstract captures the interest of the reader, and explains in future tense what the reader will read. Key parameters, such as current consumption, area or gate count, are highlighted.**

I. INTRODUCTION

The purpose of the introduction is to put the reader into the right frame of mind. Introduce the problem statement, key references, the key contribution of your work, and an outline of the work presented. Think of the introduction as explaining the "Why" of the work.

Although everyone has the same assignment for the project, you have choosen to solve the problem in different ways. Explain what you consider the problem statement, and tailor the problem statement to what the reader will read.

Key references, like [1], is introduced. Don't copy the paper text, write why they designed the circuit, how they chose to implement it, and what they achieved. The reason we reference other papers in the introduction is to show that we understand the current state-of-the-art. As such, maybe find other, more recent, image sensors. Provide a summary where state-of-the-art has moved since the original paper.

The outline should be included towards the end of the introduction. The purpose of the outline is to make this document easy to read. A reader should never be surprised by the text. All concepts should be eased into. We don't want the reader to feel like they been thrown in at the end of a long story. As such, if you chosen to solve the problem statement in a way not previously solved in a key references, then you should explain that.

A checklist for all chapters can be seen in VIII.

II. THEORY

It is safe to assume that all readers have read the key reference [1], if they have not, then expect them to do so. The purpose of the theory section is not to demonstrate that you have read the paper, but rather, highlight theory that the reader probably does not know. The theory section should give sufficient explanation to bridge the gap between references, and what you apply in this text.

III. IMPLEMENTATION

The purpose of the implementation is to explain what you did. How have you chosen to architect the solution, how did you split it up in analog and digital parts? Use one subsection per circuit.

For the analog, explain the design decisions you made, how did you pick the transistor sizes, and the currents. Use clear figures (i.e. circuitikz), don't use pictures from schematic editors. How does the circuit work? Did you make other choices than in [1]?

For the digital, how did you divide up the digital? What were the design choices you made? How did you split it up into finite state machines and pixel array control? How did you implement readout of the data? Explain what you did, and how it works. Use state diagrams and block diagrams.

IV. RESULT

The purpose of the results is to convince the reader that what you made actually works. To do that, explain testbenches and simulation results. The key to good results is to be critical of your own work. Do not try to oversell the results. Your result should speak for themself.

For analog circuits, show results from each block. Highlight key parameters, like current and delay of comparator. Demonstrate that the full analog system works. Show that the correct digital value is stored in memory. Check memory value for multiple pixel voltages, either by changing the exposure time, or changing the pixel current.

Show simulations that demonstrate that the digital works. Show how you read out the data from the pixel array.

V. DISCUSSION

Explain what the circuit and results show. Be critical.

VI. FUTURE WORK

Give some insight into what is missing in the work. What should be the next steps?

VII. CONCLUSION

Summarize why, how, what and what the results show.

VIII. ABSTRACT

Include in abstract the necessary files to reproduce the work. One good way to do it is to make a github repositry with the fiels, and give a link here.

The SPICE and SystemVerilog for the actual circuit should be included into the abstract directly. Testbenches, makefiles etc, can be linked via github.

REFERENCES

[1] Kleinfelder, Lim, Liu, Gamal "A 10 000 Frames/s CMOS Digital Pixel Sensor", JSSC, VOL 36, NO 12, 2001

TABLE I
PROJECT REPORT CHECKLIST

Item	Description	OK
Introduction		
Is the problem description clearly defined?	Describe which parts of the problem you chose to focus on. The problem description should match the results you've achived.	
Is there a clear explanation why the problem is worth solving?	The reader might need help to understand why the problem is interesting	
Is status of state-of-the-art clearly explained?	You should make sure that you know what others have done for the same problem. Check IEEEXplore. Provide summary and references. Explain how your problem or solution is different	
Is the key contribution clearly explained?	Highlight what you've achieved. What was your contribution?	
Is there an outline of the report?	Give a short summary of what the reader is about to read	
Theory		
Is it possible for a reader skilled in the art to understand the work?	Have you included references to relevant papers	
Is the theory section too long	The theory section should be less than 10 % of the work	
Implementation		
Are all circuits explained?	Have you explained how every single block works?	
Are figures clear?	Remember to explain all colors, and all symbols. Explain what the reader should understand from the figure. All figures must be referenced in the text.	
Results		
Is it clear how you verified the circuit?	It's a good idea to explain what type of testbenches you used. For example, did you use dc, ac or transient to verify your circuit?	
Are key parameters simulated?	You at least need current from VDD. Think through what you would need to simulate to prove that the circuit works.	
Have you tried to make the circuit fail?	Knowing how circuits fail will increase confidence that it will work under normal conditions.	
Discussion		
Have you been critical of your own results?	Try to look at the verification from different prespectives. Play devil's advocate, try to think through what could go wrong, then exlain how your verification proves that the circuit does work.	
Future work		
Have you explained the next steps?	Imagine that someone reads your work. Maybe they want to reproduce it, and take one step further. What should that step be?	
Conclusion		
No new information in conclusion.	Never put new information into conclusion. It's a summary of what's been done	
General comments		
Story	Does the work tell a story, is it readable? Don't surprise the reader by introducing new topics without background information.	
Cronology	Don't let the report follow the timeline of the work done. What I mean by that is don't write "first I did this, then I spent huge amount of time on this, then I did that". No one cares what the timeline was. The report does not need to follow the same timeline as the actual work.	
Too much time	How much time you spent on something should not be correlated to how much text there is in the report. No one cares how much time you spent on something. The report is about why, how, what and does it work.	
Length	A report should be consice. Only include what is necessary, but no more. Shorter is almost always better than longer.	
Template	Use https://github.com/wulffern/dic2021/tree/main/2021-10-19_project_report template for the report. Write in LaTeX. You will need LaTeX for your project and master thesis. Use http://overleaf.com if you're uncomfortable with local text editors and LaTeX.	