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# The 8 Elements of an Effective Abstract

Posted on February 7, 2012 by **Tucker Balch**

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*How to write a compelling abstract: My formula for concrete abstract success.*

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Many writers save the abstract for last. I don't. I write the abstract first. If the abstract isn't interesting, compelling, downright exciting, people aren't going to read the paper. Use the abstract to set the intellectual goals for your paper. But the paper has to live up to the promise you set. It is a contract with the reader.

I set optimistic goals for myself with the abstract. But as I write, I consult it to make sure I'm on track. If I find I can't deliver on a part of that promise, I revise the abstract accordingly. I rarely extend the claims made in the abstract.

So, crafting an abstract is a *first* step in paper writing (and sometimes a first step in research too). But the abstract isn't static, it must evolve as the paper evolves. It's a process. Give my process a try. Let me know how it works for you.

Overview: Step through each of the elements below and create one or two sentences per element. Don't worry about connecting these sentences together for now. Save that for later. Also, all these elements don't make sense for all papers: It is OK if you don't have a sentence for some elements.

**1. Problem:** What is the problem your paper addresses? Avoid describing the solution here.

*We address the problem of robot navigation across unmapped rough terrain.*

**2. Importance:** How would a solution to this problem change the world? Remember that it's not obvious to everyone else how important this problem is.

*A solution to this problem will enable more rapid validation of the efficacy of sleep medication.*

**3. New capability:** What can we do now that we couldn't do before? Quantify if possible.

*Our approach enables robots to climb trees five times more quickly than was possible before.*

**4. Challenge:** Why is this problem hard? and/or What difficulty do other solutions face?

*In order to solve this problem a robot must know its location to within 1mm.*

*Traditional approaches to this problem are exponential in the number of obstacles in the environment.*

**5. Background:** A sentence or two about other approaches; yours or others.

*Smith and Jones address this by building a polygonal model of the obstacle field, creating a visibility graph, then applying Dijkstra's algorithm.*

**6. Insight:** What did you discover? or How did you approach the problem differently?

*By framing the problem as an optimization task, we are able to leverage a linear time algorithm.*

**7. Solution:** Provide some specific detail about the solution.

*Our algorithm measures the standard deviation of the quantitative features in each dimension, then sorts the result, providing an optimal solution.*

**8. Evidence:** Summarize the evidence you have for your approach: A proof, an implementation, or quantitative results.

*The algorithm was implemented on a monkey-based robot and shown to perform 17% faster than a dog of similar mass.*

Now that you have some text for each element above (or most of them), try piecing them together. My order above is a typical way to order things, but it isn't necessary that you keep the order I have. Once you have a good order, read it over and over. Smooth the rough edges.

You will find that you need to add some "glue" verbiage. It's usually necessary, for instance, to provide a little more background information to help the elements hang together.

Read through the abstract and revise it, polish it. Avoid repeated words. Have other people read it. This is the most important paragraph of your paper.

Good luck!

Phillip Koopman at CMU has a similar [view](http://www.ece.cmu.edu/~koopman/essays/abstract.html) (<http://www.ece.cmu.edu/~koopman/essays/abstract.html>).

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Animesh

February 7, 2012

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This is very insightful, sir,

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Tucker R Balch

February 7, 2012

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Hi Animesh, Thanks! I thought it would be good for my students to have an outline.

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