Some thoughts about writing a survey paper

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Regular research papers are a description of your own research. A survey paper is a service to the scientific community. You are doing their research for them. Instead of reading 20+ papers to understand what a scientific topic is about, they just need to read your paper.

Which subjects should you write a survey about: fields which are on the verge of maturity, but do not yet qualify for a book. If there are less than 10 scientific papers in a field, do not write a survey. If all the 10 are from the same author, do not write a survey. If there is already an exhaustive, recent survey, do not write another

What should it go into a survey paper? The question needs to be asked in reverse: what do you want from a survey? How do you make the survey most useful to the readers?

Introduction

- A clear description of the field. What is it a subset of? What is the current status?

- Boilerplate is not useful → bla-bla-bla networks have seen a lot of interest in recent years...

- short history: was there a seminal paper, research funding, special event, invention of an algorithm which spurred the development. Do not be afraid to anchor your domain in reality. 9/11 spurred a lot of research development (and funding) in surveillance system. The introduction of java gave a new impetus to just-in-time compiler optimization research, and so on.

- Which are the conferences, workshops, journals, special editions which are carrying the papers related to the topic?

Terminology

Introduce the terminology of the field, describe what the various terms mean. What is very important is to map the terminological variations.

For instance, in the sensor network domain, mobile sink, mobile agent, mobile data collectors usually means the same thing. In addition, some researchers

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borrow terms like actuator, or invent specific new terms like "mole" for the same thing.

You need to clerify these things, so start by keeping a note of the various terms while you are reading papers.

Research challenges

The description of the various research challenges of the field. This is the hardest to write, because it is the part which is creative. You need to provide an integral view on the research activity of the field.

You should start noting out the various objective descriptions from various papers. But it is not enough to just put them together: you need to rewrite them in your own words. Partially for the reason of copyright, and second, because you need to write a good writeup, which covers all the papers not just one.

One can call this step "reverse engineering a vision". If your domain has a "vision" paper, that might help, but be cautious: you still can not borrow your writeup from the vision paper, if you really need to take a whole field.

It is helpful to identify 3-4 main research directions, around which you will organize your papers.

Classification, slicing and dicing, taxonomy

Sometimes it helps do introduce a new taxonomy that is classification scheme in the field.

The paper surveys

And here comes where you survey your papers. This is how it goes:

- Decide what are you going to tell about each paper. You need to already read the paper in such a way that you know ahead what are you want to tell about them.

- For instance:

    - which one of the 3-4 big research directions they tell?
    - what mathematical techniques or algorithms they rely on? (eg. linear programming, genetic algorithms, neural network, hidden Markov models' etc.).
    - is this a theory or application paper?
    - is it the continuation of another work? is it an improvement on another work? (you might want to present them in order!!!).
    - do they use theoretical proofs? simulation? hardware testbed? real life deployment?
    - which other technology they compare themselves with? In which way are they better? Note: all the papers you will encounter are at least in some ways better than others. You need to identify the authors claim; higher performance (under certain assumptions)? higher robustness? lower computational complexity?

It would help if you would assemble your reading list completely first, and when you read the papers, you write down the answers to these question, as you read them.

About citations: strong recommendation that in your survey do indicate the comes of the authors as well: Laurel and Hardy [2] did this, W. E. Coyote [3] did that.

There are two reasons for this. One, it is politeness towards the authors, whose work you are surveying. Your debt to them is much greater than in a cost of an original research paper. Second, when your reader read your survey paper as a primer for a field, they are also interest in finding out, who are the researchers active in the field. If some university or lab had a special leadership role, it is worth mentioning as well: Many early contributions in bla-bla-bla networks come from the W.E.Loyote's group at Hollywood Inst. of Tech Media lab.

It almost always helps to creat a nice big table to summarize them.