

Positioning Your Research Work

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2006-12

When we are doing research, we have to realize what kind of the position of our research is located on.

When we read a good paper, at least three things must be understood from reading.

1. What is the domain question which this paper is discussing?
2. For solving this domain question, we have to build a model to simplify the domain question. Of course the model is oriented for solving problem, instead of describing or understanding problem.
3. What we are usually interested on are solving the modeled problem by computing technologies.

So I call the above ideas as Qmt model of doing research, as illustrating in the Figure 1.

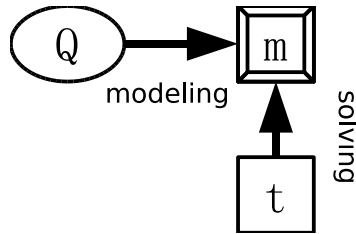


Figure 1: Qmt model of doing research.

Q: domain question; m: computing model oriented problem solving; t: solving technologies based on computing.

Please note that Q and m are of granuty. That means sometime m can be divided into another Q' for some smaller or simpler m'. Or in another word, the Q in the Figure 1 might be the final question by a serious transferring:

$$Q^0 \rightarrow m^0 \rightarrow Q^1 \rightarrow m^1 \dots \rightarrow Q \quad (1)$$

In my understanding, constructing a model for a domain question Q is a **scientific problem**, and solving m by t is an **engineering problem**.

So based on the results of what Figure 1 provided, we can do researches from the following different approaches.

- The first simple idea is to employ new computing technologies to the same modeled problem. We keep the mapping phase unchanged. This is the first layer of doing research. For a computer major student, this could be easily done. Figure 2 illustrates this approach clearly. Evaluation of this kind

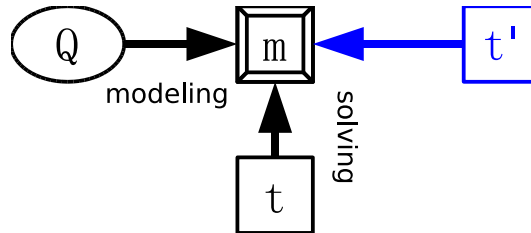


Figure 2: Try new computing technology t' to attack the same modeled problem m .

of research work is also simple: just compare the results of when t' is employed with that of when the original t was applied.

- The second approach is to find a new domain question Q' which can be mapped into an existing modeled problem m so that the technologies solving for m can be easily ported to solving domain question Q' . Figure 3 depicts the idea. Evaluation of this kind of research work is a little bit

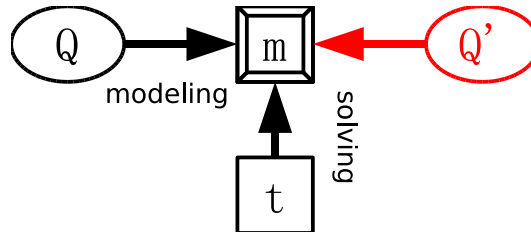


Figure 3: Find a new domain question Q' which can be mapped into an existing computing model m , therefore the same technology t can be employed to solve new domain problem Q' .

difficult because it must be at the layer of the domain question. The point here is whether the domain question Q' is solved or not, and whether actual Q' is solved beautifully or not.

- The third approach is to build a new model m' for the domain question Q , or just simply modify m to m' . Thereafter the technology t' for solving m' is also new in terms of solving Q . Figure 4 describes such idea. Introducing a new model usually involves plenty of domain knowledges.

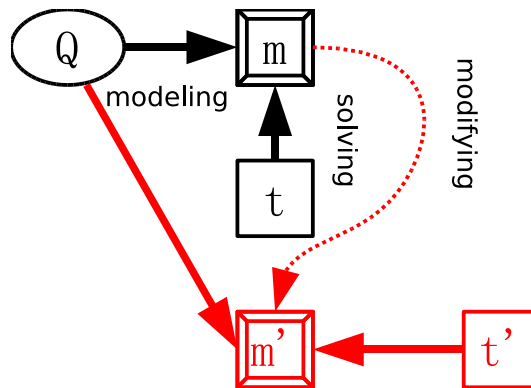


Figure 4: Build a new model m' for the domain question Q thereafter new technology t' related to Q is introduced to attack the modeled question m' .

It is natural that evaluation of this kind of research work is very specific on the application domain. For a computer major researcher, this means you have to learn a new domain. But if you can only deal with modeled problems, it is hard for you to reach a higher layer.

- Finally the best approach is to find a new domain question which no one else has ever studied. But you have to justify the new problem is valuable for solving. But wait a second, how can you prove this is a new domain question?

If needed, we can divide computing technology t into more fine components:

- Computing platform: including hardware platform and software platform for solving modeled problem m .
- Algorithm: the logical designs (data structures and operational logics on these data structures) of how to solve m under the computing platform.
- Implementation: the detail specific expression of the algorithm running on the computing platform.