

5118008 English for Software Developer

# A Path To Understanding Computation

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Shin Hong



<https://www.theparisreview.org/blog/2019/05/14/children-with-mothers-dont-eat-houses/>


# Feedback on Your Personal Report

- Found most of students had studied hard and seriously
- Policy
  - Let a personal report be 1-page (singled) in A4
  - No cover page
- Recommend
  - interpretation, component analyses, word examples
- Disrecommend
  - a long summary on the content

# First Three Paragraphs

<sup>1</sup> What is computation?

<sup>2</sup> This question lies at the core of computer science. This chapter provides an answer—at least a tentative one—and connects the notion of computation to some closely related concepts.

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- <sup>3</sup>In particular, I explain the relationship between computation and the concepts of problem solving and algorithms.
- <sup>4</sup>To this end, I describe two complementary aspects of computation: what it does, and what it is.

<sup>5</sup> This first view, *computation solves problems*, emphasizes that a problem can be solved through computation once it is suitably represented and broken down into subproblems.

<sup>6</sup> It not only reflects the tremendous impact computer science has had in so many different areas of society but also explain why computation is essential part of all kinds of human activities, independent of the use of computing machines.

<sup>7</sup> However, the problem-solving perspective leaves out some important aspects of computation.

<sup>8</sup> A closer look at the difference between computation and problem-solving leads to a second view, *computation is algorithm execution*.

<sup>9</sup> An algorithm is a precise description of computation and makes it possible to automate and analyze computation.

<sup>10</sup> This view portrays computation as a process consisting of several steps, which helps explain how and why it is so effective in solving problems.



# No Computation without Representation

<sup>11</sup> If a computation consists of a number of steps, what does each of these steps actually do, and how can all the steps together produce a solution to the given problem?

<sup>12</sup> To produce an aggregate effect, each step has to have an effect that the next steps can build on so that the cumulative effect produced by all the steps results in a solution for the problem.

<sup>13</sup> In the story the effect of each step is to change Hansel and Gretel's location, and the problem is solved when the location is finally changed to their home.

<sup>14</sup> In general, a step in a computation can have an effect on almost anything, be it concrete physical objects or abstract mathematical entities.

<sup>15</sup> To solve a problem it is necessary that a computation manipulate a representation of something meaningful in the real world.

<sup>16</sup> Hansel and Gretel's locations represent one of two possible states: all locations in the forest represent the problem state of danger and possibly death, while their home represents the solution state of safety and survival.

<sup>17</sup> This is why computation that brings Hansel and Gretel home solves a problem—it moves them from danger to safety.

<sup>18</sup> In contrast, a computation that leads from one place in the forest to another would not achieve that.

# Last Two Paragraphs

<sup>19</sup> The execution of an algorithm has to pay for its effect with the use of resources.

<sup>20</sup> Therefore, in order to compare different algorithms for the same problem, it is important to be able to measure the sources they consume.

<sup>21</sup> Sometimes we may even want to sacrifice correctness for efficiency.

<sup>22</sup> Suppose that you are on your way to your office and you have to grab a few items from the grocery store.

<sup>23</sup> Since you are in a hurry, you leave the change behind instead of storing the coins returned to you.

<sup>24</sup> The correct algorithm would exchange the exact amount of money for the bought items, but the approximation algorithm that rounds up finishes your transaction faster

<sup>25</sup> Studying the properties of algorithms and their computations, including the resource requirements, is an important task of computer science.

<sup>26</sup> It facilitates judging whether a particular algorithm is a viable solution to a specific problem

<sup>27</sup> Continuing with the story about Hansel and Gretel, I explain in Chapter 2 how different computations can be produced with one algorithm and how to measure the resource required.



# Key Sentences

- An algorithm is a precise description of computation and makes it possible to automate and analyze computation.
- In contrast, a computation that leads from one place in the forest to another would not achieve that.
- It facilitates judging whether a particular algorithm is a viable solution to a specific problem.