NUS National University of Singapore

School of Computing

The Tourist Problem: (Problem Modeling and Transformation) Video 5.7

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Experience the fun of problem solving

Our problem solving, so far…

- Two ways to solve Tourist Problem v1.0
- Solve with a direct method (Activity 1)
  - Using notation of non-conflicts (and conflicts)
  - Tedious and error-prone, does not scale
- Model with conflict graph (Activity 2)
  - Solve with Graph Colouring
  - Coloured graph ➔ bus schedule
  - Scale very well.

Why use graph models?

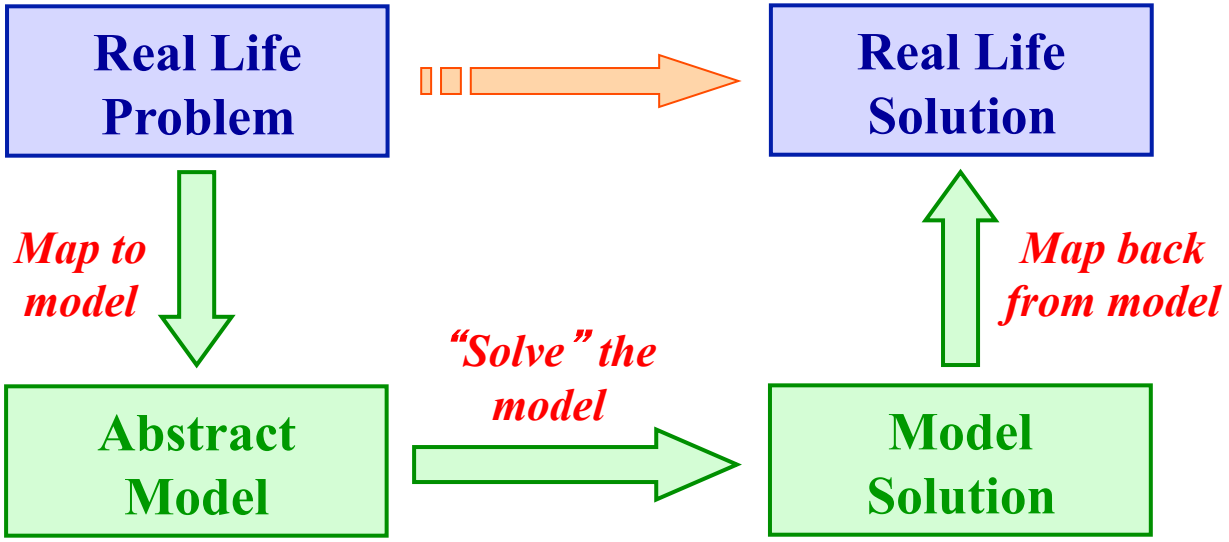
How to create conflict graph G=(V,E)?

- Simple algorithm for conflict graph generation
- Coded into computer programs
- Can easily handle very large graphs

Today many software use graph models

- Build graphs with millions of vertices
- Scales very well

Abstract Problem Modeling…



The Real-world, Model-world Transformation Diagram

A long-winded process?

What a *strange, long-winded solution* process?

Example: Your left ear is itchy…

Direct method:

- Use left hand, *directly*!

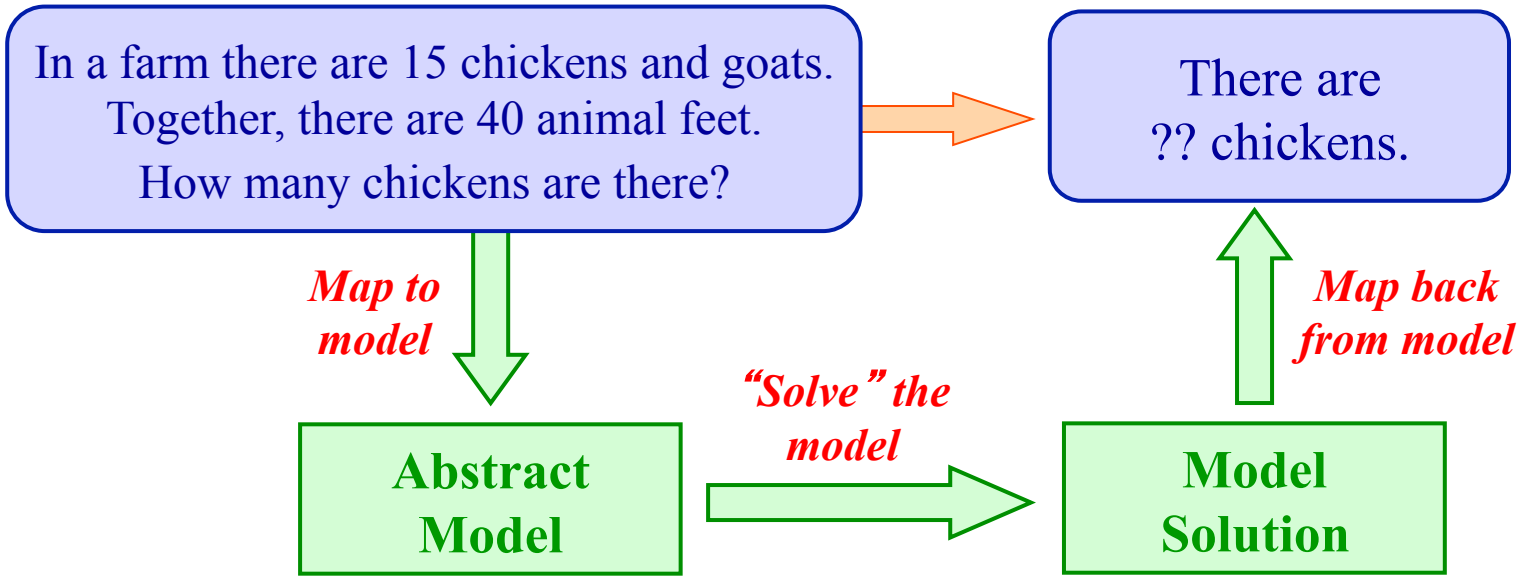
Indirect 3-step method:

- Use right hand;
- Move right hand behind your head,
- Reach back and touch the left ear

I suggest you try this 3-step method now, at least once.

Modeling: An example

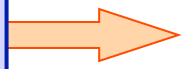
- **Nothing new. You do it *all the time*.**



Modeling: An example

❑ Using a Direct Method

In a farm there are 15 chickens and goats.
Together, there are 40 animal feet.
How many chickens are there?



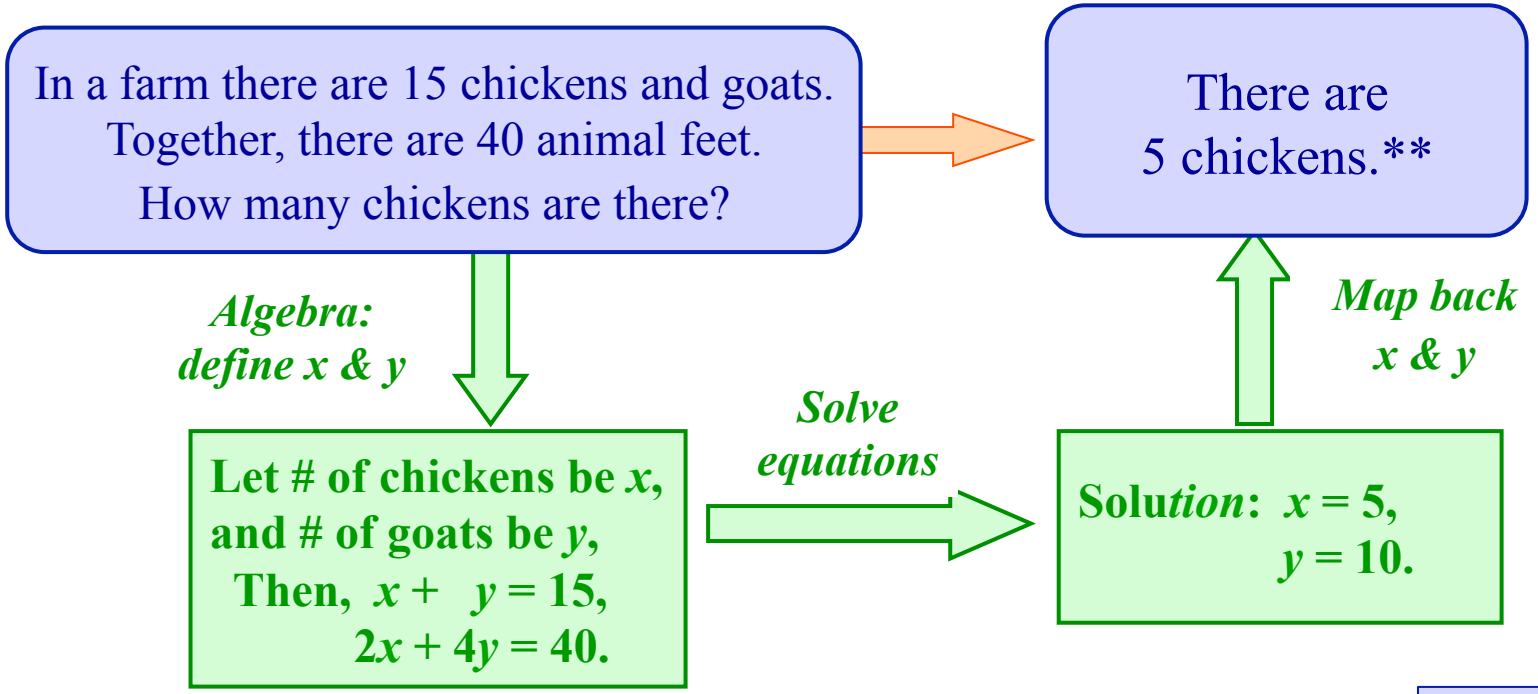
There are
?? chickens.

Draw picture,
Count legs,
Adjust as needed.

Would you use this method?

Modeling: An example

❑ Using modeling process



Back from correct #Chicken

Quick Recap:

Step 1: We use ALGEBRA

Define x, y,

Capture constraints with equations

Step 2: solve equations for x and y

Step 3: Map back to chickens and goats

REMEMBER: Don't forget Step 3.

Problem Transformation…

This is also called ***Problem Transformation***

We transform the real-life problem into
a new abstract problem,

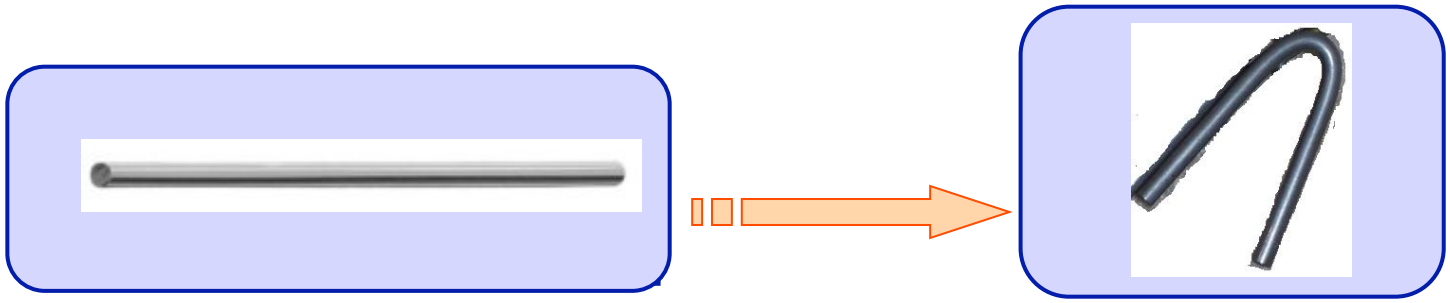
Solving this abstract problem will give
solution to our real-life problem,

Hopefully this problem is easier to solve.

Also called Problem Reduction in CS/CT.

Modelling: Another example

- **Bend a steel bar (5cm diameter)**



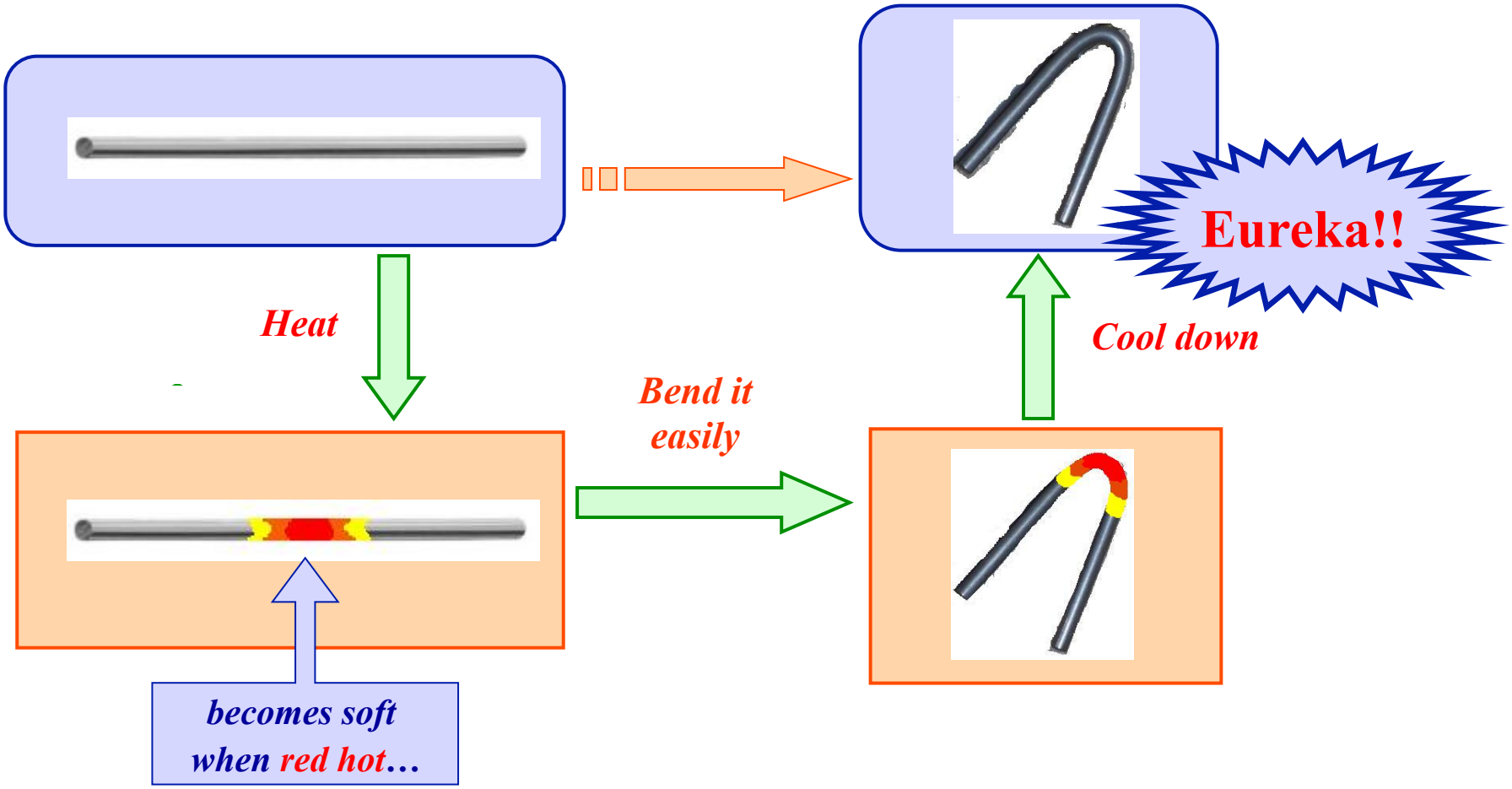
(Direct method)

Man bending steel rod

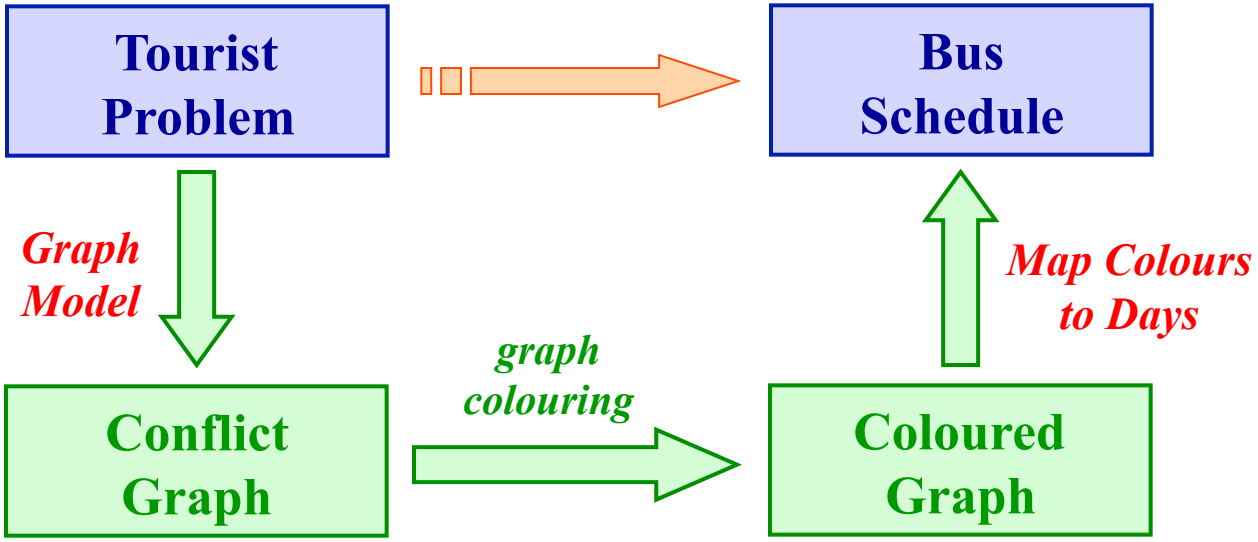
It works! But not for everyone.

Modeling: Another example (2)

- **Bend a steel bar (using *transformation*)**



For our Tourist Problem



Education is about Transformation

Seen three very different examples of
Transformation…

Watch out for transformation in you
as you go through university education

Actually, all of education is about

Transformation…

Graph colouring is Way Cooler

Graph Colouring *does more* than this…

You wanna know?

…watch the next video

(End of video 5.7)

If you want to contact me,

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Modelling… (correct #chickens)

- **Nothing new. You do it *all* the time.**