Multimedia and computer animation

Exercise - Inverse Kinematics

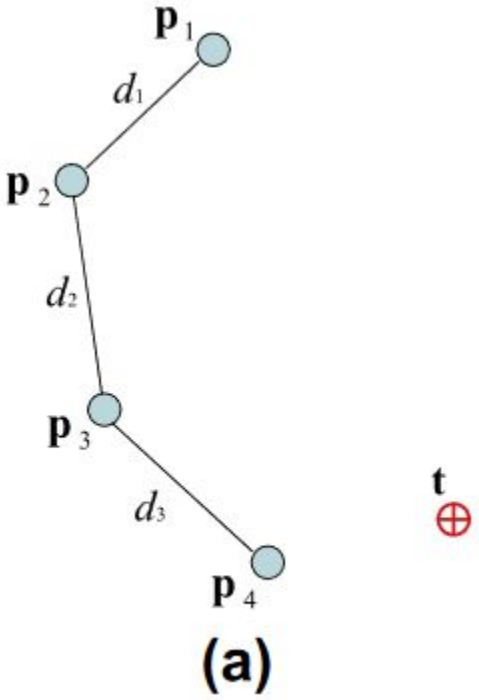
From the lecture…

- Aims to find joint parameters such that the last joint/point ends up in the desired position
- Various algorithms
  - Inverse Jacobian
  - CCD
  - FABRIK

FABRIK

- Relatively simple algorithm
- Iterative - need to set max. iterations or positional error
- Forward And Backward Reaching Inverse Kinematics
  - Forward step
  - Backward step
  - Repeat until end conditions are met

Visually



Source: http://www.andreasaristidou.com/publications/papers/FABRIK.pdf

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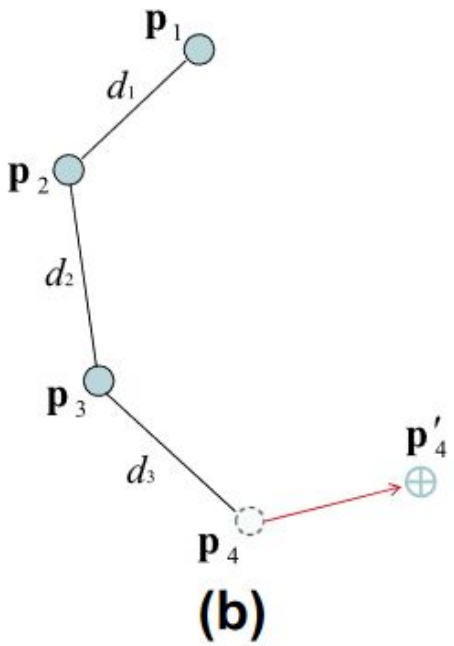

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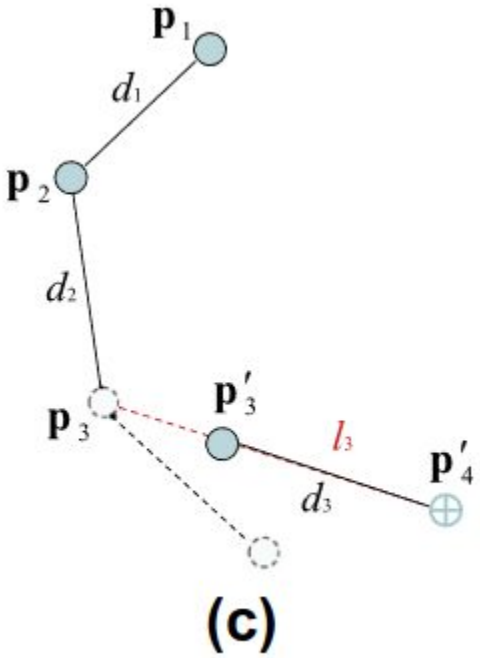

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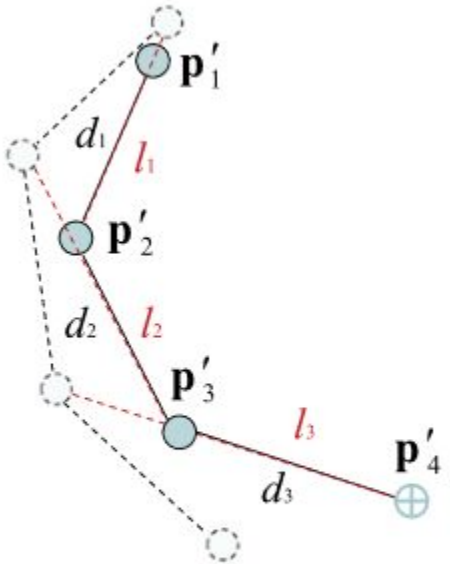

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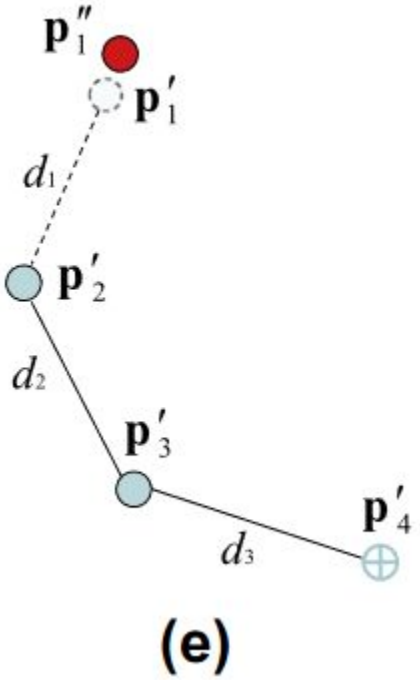

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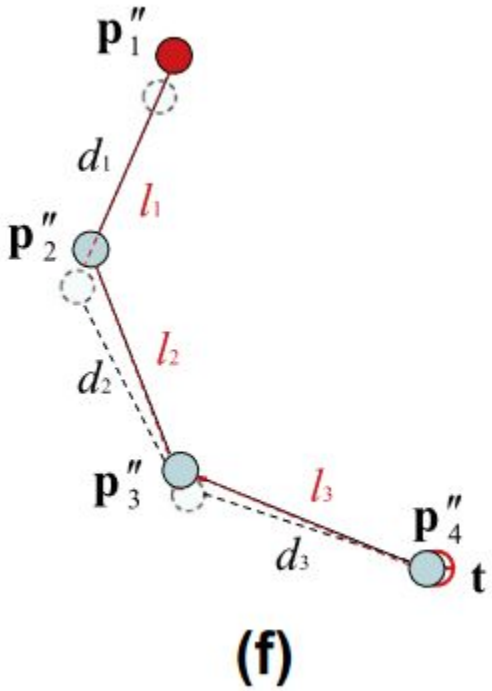

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FABRIK - extension

- It is possible to apply movement limits
  - Joints of a human arm cannot rotate arbitrarily; there are limits to how you can bend your arm
  - Limits can be applied inside the algorithm itself, after each forward/backward step
  - Can be done by limiting angular deviation from the joint’s center axis

Task

Complete the FABRIK implementation in the template

- FABRIKComponent.cpp
  - FABRIKSingleIteration()
  - You can find information about class variables in the comments
  - To complete:
    - Forward step
    - Backward step
  - The outer iteration loop and the edge case of a too distant goal are already implemented