Problems arising in complex preference specification problems

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Usual Assumptions in MCDM

1. There is a single decision making problem.

2. The decision space is a fixed set of alternatives.

3. Decisions are evaluated and compared in terms of a small set of criteria, which map the decisions to outcome vectors.

4. This set of criteria is fixed.

5. The decision maker compares complete outcome vectors, but can represent multiple comparisons by ceteris-paribus preferences.

What about Complex Problems?

1. Crew scheduling:

   - Huge decision space (1000+ activities; 100+ captains)
   - Company look at total cost when comparing schedules, but captains look at the lines-of-work.
   - Problems are repeated for different time periods.

2. Product configuration:

   - Infi nite decision space (confi gurations are unbounded component trees).
   - Component choice is a decision-making problem in its own right.
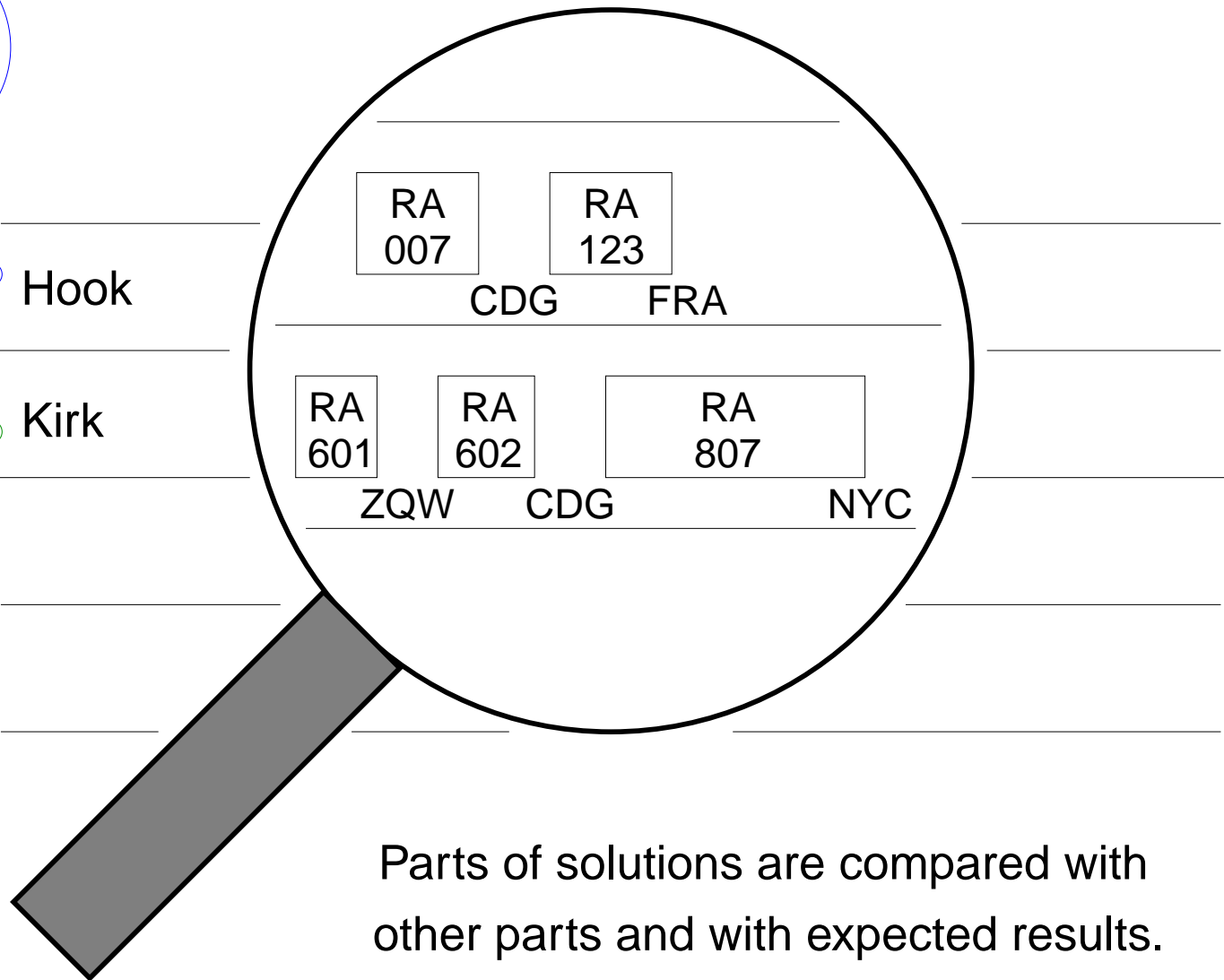   - Confi gurations may differ in structure and are not easy to compare.

Detail Matters

Where is my flight to Hawaii from last time?

Hook

Kirk

Why has Hook three days off but not me?

RA 007

RA 123

CDG   FRA

RA 601

RA 602

RA 807

ZQW   CDG   NYC

Parts of solutions are compared with other parts and with expected results.

Composition Matters

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   - B1: small computer with 1OO GB hard disk
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3. ## Problem 3: choice of a home video system

   - consists of a video camera and a computer

   $\Rightarrow$ we cannot derive the preference of A1+B1 over A2+B2

Scope of Comparisons

1. Nature of complex comparisons:

   - a comparison concerns a limited set of criteria.
   - it ignores the values of the other criteria.

2. Result are preferences with a limited scope:

   - a decision A is preferred to a decision B if the criteria set C is all what is compared

3. New questions:

   - How to combine preferences with different scope?
   - Can the preferences be extended if new criteria are added?
   - How to elicit the scope when eliciting the preferences?