TIM 105/205, Lecture #13 (11/7/13)

Agenda:

- Complete process for conceptual design for new products.
- Utility function for assessing, comparing & then selecting a feasible design concept
- Project Phase 1 feedback
- Midterm
- Turn in completed HW #5
- Work on HW #6 before Tuesday; midterm correction between Tuesday & Thursday

Examples

Let's take a look at these chapters in the book:

Chapter on Concept Generation
(Example: Roofing Nailer)

Chapter on Concept Selection
(Example: outpatient syringe)

Utility function for comparing & assessing several competing design concepts (alternatives) [Step 7 in conceptual design process]

Def. of the problem (Objective, Goal)

- Observation

- Assume that we have n selection criteria ($5 < n < 100$) for comparing alternative design concepts

- Not all these selection criteria are equally important

- How do we rationally assign "weights" to each selection criteria to indicate the importance of that criteria?

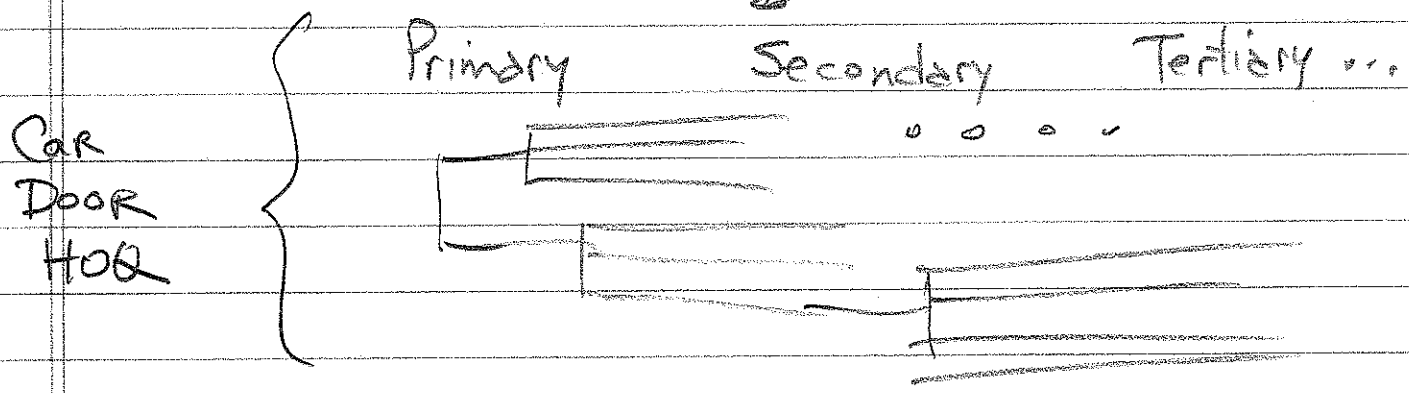
- (Selection criteria are obtained from the HOQ)

Plan / Process:

Construct a utility function that provides the appropriate weight, w_i, for each selection criteria, S_i; $(i=1,2,\ldots n)$

1. Organize the selection criteria as a hierarchy [combination of customer & engineering "needs"]

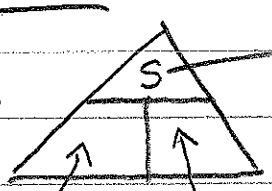
(See the 1-page "Car door" HOQ for an example:)



2. At each level of the hierarchy assign relative weights (based on group discussion, etc.) for selection criteria

3. At each level, compute (calculate) the absolute weight for the selection criteria

Convention

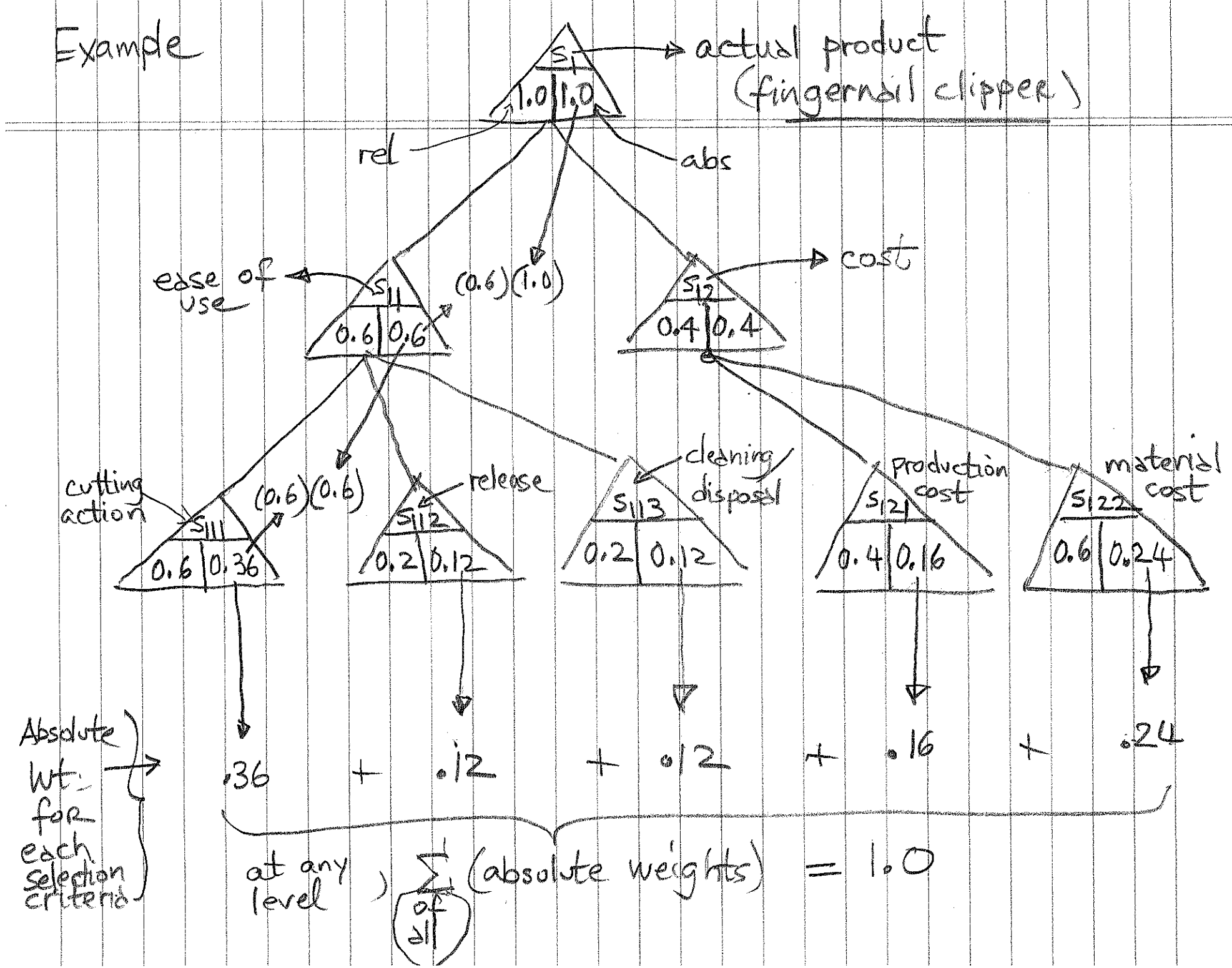


selection criteria

relative weight (assign)

absolute weight (calculate)

Example


S1
1.0 | 1.0
actual product
(fingernail clipper)
rel
abs
ease of use
S11
0.6 | 0.6
(0.6)(1.0)
S12
0.4 | 0.4
cost
cutting action
S111
0.6 | 0.36
(0.6)(0.6)
S112
0.2 | 0.12
release
S113
0.2 | 0.12
cleaning disposal
S121
0.4 | 0.16
production cost
S122
0.6 | 0.24
material cost
Absolute Wt. for each selection criteria
.36 + .12 + .12 + .16 + .24
at any level, Σ (absolute weights) = 1.0
of S11

9.31

Step 8: Use the utility function (above) (in the conceptual design process) to select 1-2 feasible concepts for further development (prototyping, testing, ...)

(Scale: 1-5 for ranking)

Selection Criteria		Absolute weight	Concept 1			Concept 2	
			Concept Rating		Utility	Concept Rating	Utility
(cutting)	S_1	0.36	* 5	=	1.8	5	1.8
(release)	S_2	0.12	* 4	=	.48	4	.48
(cleaning)	S_3	0.12	* 4	=	.48	2	.24
:	:	:	:		:		:
$\sum_1^n$ (summation)		1.0			$(CU)_1 = 4.76$		$(CU)_2 = 3.32$

$(CU)_1$: cumulative utility

- Compute the cumulative utility (CU) for each concept
- Rank the design based on the CU
- The higher the CU, the higher the rank