Tutorial AMPL

Part V

Eduardo Camponogara

Department of Automation and Systems Engineering
Federal University of Santa Catarina

October 2016

Piecewise-Linear Approximation

CC Model

Tasks

Summary

Piecewise-Linear Approximation

Model and solve the problem

$$\begin{aligned} &\max \ f(x) \\ &\text{s.t.} : x \in \mathcal{X} \end{aligned}$$

in which

- f is a piecewise-linear function;
- x is a decision variable in the range $[l, u]$.

Problem Data

Function f is given by the following points:

x	$f(x)$
0	7
1	5
2	6
3	1
4	5
5	6
6	7
7	4
8	2

Summary

CC Model

cc.mod:

```
# Part 1: Variable Declaration (var, set, param, etc)
param n;
set N := 0..n;
param X {i in N};
param Y {i in N};

var lambda_Var{i in N};
var  z_Var{ 1..n };
var  x_Var >= 0;

# Part 2: Objective Function
maximize objective: sum{i in N} Y[i]*lambda_Var[i];
```

CC Model

cc.mod:

```
# Part 1: Variable Declaration (var, set, param, etc)
param n;
set N := 0..n;
param X {i in N};
param Y {i in N};

var lambda_Var{i in N};
var  z_Var{ 1..n };
var  x_Var >= 0;

# Part 2: Objective Function
maximize objective: sum{i in N} Y[i]*lambda_Var[i];
```

CC Model

cc.mod:

```
# Part 1: Variable Declaration (var, set, param, etc)
param n;
set N := 0..n;
param X {i in N};
param Y {i in N};

var lambda_Var{i in N};
var  z_Var{ 1..n };
var  x_Var >= 0;

# Part 2: Objective Function
maximize objective: sum{i in N} Y[i]*lambda_Var[i];
```

CC Model

```
# Part 3: Constraints
subject to cst1:
        x_Var = sum{i in N} lambda_Var[i]*X[i];
subject to cst2:
        lambda_Var[0] <= z_Var[1];
subject to cst3{i in 1..(n-1)}:
        lambda_Var[i] <= z_Var[i] + z_Var[i+1];
subject to cst4:
        lambda_Var[n] <= z_Var[n];

subject to cst5:
        sum{i in 1..n} z_Var[i] = 1;
subject to cst6:
        sum{i in N} lambda_Var[i] = 1;
```

CC Model

```
# Part 3: Constraints
subject to cst1:
        x_Var = sum{i in N} lambda_Var[i]*X[i];
subject to cst2:
        lambda_Var[0] <= z_Var[1];
subject to cst3{i in 1..(n-1)}:
        lambda_Var[i] <= z_Var[i] + z_Var[i+1];
subject to cst4:
        lambda_Var[n] <= z_Var[n];

subject to cst5:
        sum{i in 1..n} z_Var[i] = 1;
subject to cst6:
        sum{i in N} lambda_Var[i] = 1;
```

CC Model

```
# Part 3: Constraints
subject to cst1:
        x_Var = sum{i in N} lambda_Var[i]*X[i];
subject to cst2:
        lambda_Var[0] <= z_Var[1];
subject to cst3{i in 1..(n-1)}:
        lambda_Var[i] <= z_Var[i] + z_Var[i+1];
subject to cst4:
        lambda_Var[n] <= z_Var[n];

subject to cst5:
        sum{i in 1..n} z_Var[i] = 1;
subject to cst6:
        sum{i in N} lambda_Var[i] = 1;
```

Summary

Tasks

1. Implement the DCC Model.
2. Implement the SOS2 Model.

Challenges

1. Implement the DLog Model.
2. Implement the Log Model.

AMPL Tutorial

- Thank you for attending this lecture!!!