Figure 3.4 Recovering the Legislators

With Higher Error

	Roll Calls				
Legislators	**1**	**2**	**3**	**4**	**5**
One	Y	Y	***N***	Y	Y
Two	N	Y	Y	Y	Y
Three	N	N	Y	Y	Y
Four	N	N	N	Y	Y
Five	N	N	N	N	Y
Six	N	N	N	N	N

Agreement Scores

1.0					
.6	1.0				
.4	.8	1.0			
.6	.6	.8	1.0		
.4	.4	.6	.8	1.0	
.2	.2	.4	.6	.8	1.0

First Eigenvector

$X_1 = -.44512$

$X_2 = -.48973$

$X_3 = -.11093$

$X_4 = .04431$

$X_5 = .34859$

$X_6 = .65288$

Figure 3.5 The Janice Algorithm: Roll Calls

Legislators $X_2 < X_1 < X_3 < X_4 < X_5 < X_6$

Predicted Patterns of All Possible Rank Positions For a Roll Call Cutting point Given the Legislator Ordering Above

(Yea on the Left, Nay on the Right)

							Number of Errors On Roll Calls 1	2	3	4	5
$Z_j < X_2$	N	N	N	N	N	N	1	2	2	4	5
$X_2 < Z_j < X_1$	Y	N	N	N	N	N	2	1	1	3	4
$X_1 < Z_j < X_3$	Y	Y	N	N	N	N	*1*	*0*	2	2	3
$X_3 < Z_j < X_4$	Y	Y	Y	N	N	N	2	1	*1*	1	2
$X_4 < Z_j < X_5$	Y	Y	Y	Y	N	N	3	2	2	*0*	1
$X_5 < Z_j < X_6$	Y	Y	Y	Y	Y	N	4	3	3	1	*0*
$X_6 < Z_j$	Y	Y	Y	Y	Y	Y	5	4	4	2	1

(Nay on the Left, Yea on the Right)

$Z_j < X_2$	Y	Y	Y	Y	Y	Y	5	4	4	2	1
$X_2 < Z_j < X_1$	N	Y	Y	Y	Y	Y	4	5	5	3	2
$X_1 < Z_j < X_3$	N	N	Y	Y	Y	Y	5	6	4	4	3
$X_3 < Z_j < X_4$	N	N	N	Y	Y	Y	4	5	5	5	4
$X_4 < Z_j < X_5$	N	N	N	N	Y	Y	3	4	4	6	5
$X_5 < Z_j < X_6$	N	N	N	N	N	Y	2	3	3	5	6
$X_6 < Z_j$	N	N	N	N	N	N	1	2	2	4	5

Figure 3.6 The Janice Algorithm: Legislators

Roll Calls $Z_1 = Z_2 < Z_3 < Z_4 < Z_5$

Predicted Patterns of All Possible Rank Positions for a Legislator Given the Cutting Point Ordering Above
(Roll Call Polarity From Table 3.5)

						Number of Errors On Legislators					
						1	2	3	4	5	6
$X_i < Z_1$	L	L	L	L	L	***1***	1	2	3	4	5
$Z_1 = X_i = Z_2$	R	L	L	L	L	2	***0***	1	2	3	4
$Z_2 < X_i < Z_3$	R	R	L	L	L	3	1	***0***	1	2	3
$Z_3 < X_i < Z_4$	R	R	R	L	L	2	2	1	***0***	1	2
$Z_4 < X_i < Z_5$	R	R	R	R	L	3	3	2	1	***0***	1
$Z_5 < X_i$	R	R	R	R	R	4	4	3	2	1	***0***

The application of the Janice algorithm shown in Figure 3.6 produces the following joint ordering of legislators and cutting points:

$$X_1 < Z_1 = Z_2 = X_2 < X_3 < Z_3 < X_4 < Z_4 < X_5 < Z_5 < X_6$$

This joint ordering produces only one classification error – legislator One is predicted to vote Yea (L) on roll call 3 and she actually votes Nay (R).

Figure 3.7 The Janice Algorithm: Second Iteration For Roll Calls

Legislators $X_1 < X_2 < X_3 < X_4 < X_5 < X_6$

Predicted Patterns of All Possible Rank Positions for a Roll Call Cutting Point Given the Legislator Ordering Above

(Yea on the Left, Nay on the Right)

							Number of Errors On Roll Calls 1	2	3	4	5
$Z_j < X_1$	N	N	N	N	N	N	1	2	2	4	5
$X_1 < Z_j < X_2$	Y	N	N	N	N	N	***0***	1	3	3	4
$X_2 < Z_j < X_3$	Y	Y	N	N	N	N	1	***0***	2	2	3
$X_3 < Z_j < X_4$	Y	Y	Y	N	N	N	2	1	***1***	1	2
$X_4 < Z_j < X_5$	Y	Y	Y	Y	N	N	3	2	2	***0***	1
$X_5 < Z_j < X_6$	Y	Y	Y	Y	Y	N	4	3	3	1	***0***
$X_6 < Z_j$	Y	Y	Y	Y	Y	Y	5	4	4	2	1

(Nay on the Left, Yea on the Right)

$Z_j < X_1$	Y	Y	Y	Y	Y	Y	5	4	4	2	1
$X_1 < Z_j < X_2$	N	Y	Y	Y	Y	Y	6	5	3	3	2
$X_2 < Z_j < X_3$	N	N	Y	Y	Y	Y	5	6	4	4	3
$X_3 < Z_j < X_4$	N	N	N	Y	Y	Y	4	5	5	5	4
$X_4 < Z_j < X_5$	N	N	N	N	Y	Y	3	4	4	6	5
$X_5 < Z_j < X_6$	N	N	N	N	N	Y	2	3	3	5	6
$X_6 < Z_j$	N	N	N	N	N	N	1	2	2	4	5

The joint rank order produced by Figure 3.7 is:

$$X_1 < Z_1 < X_2 < Z_2 < X_3 < Z_3 < X_4 < Z_4 < X_5 < Z_5 < X_6$$

This joint ordering produces only one classification error – legislator One is predicted to vote Yea on roll call 3 and she actually votes Nay.

The one-dimensional Optimal Classification method (***The Edith Algorithm***) is:

1) Generate starting estimate of the legislator rank ordering
2) Holding the legislator rank ordering fixed, use the Janice algorithm to find the optimal cutting point ordering
3) Holding the cutting point ordering fixed, use the Janice algorithm to find the optimal legislator ordering
4) Go to (2)

In the example above,

Step (1) $X_2 < X_1 < X_3 < X_4 < X_5 < X_6$

Step (2a) $Z_1 = Z_2 < Z_3 < Z_4 < Z_5$

Step (3a) $X_1 < X_2 < X_3 < X_4 < X_5 < X_6$

Step (2b) $Z_1 < Z_2 < Z_3 < Z_4 < Z_5$

Step (3b) $X_1 < X_2 < X_3 < X_4 < X_5 < X_6$

Step (2c) $Z_1 < Z_2 < Z_3 < Z_4 < Z_5$

etc.

The Edith algorithm always converges to a solution in which the two rank orderings reproduce each other. This joint rank ordering of cutting points and legislators is a very strong form of ***conditional global maximum*****.**