



---

# Fast Spherical Search Algorithm

*Carl Christian Liebe*

Jet Propulsion Laboratory  
California Institute of Technology

March 2004





- 
- 1. Introduction**
  - 2. Spherical Search Structure**
  - 3. Spherical Search Algorithm**
  - 4. Implementation**
  - 5. Conclusions**

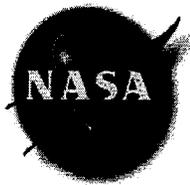




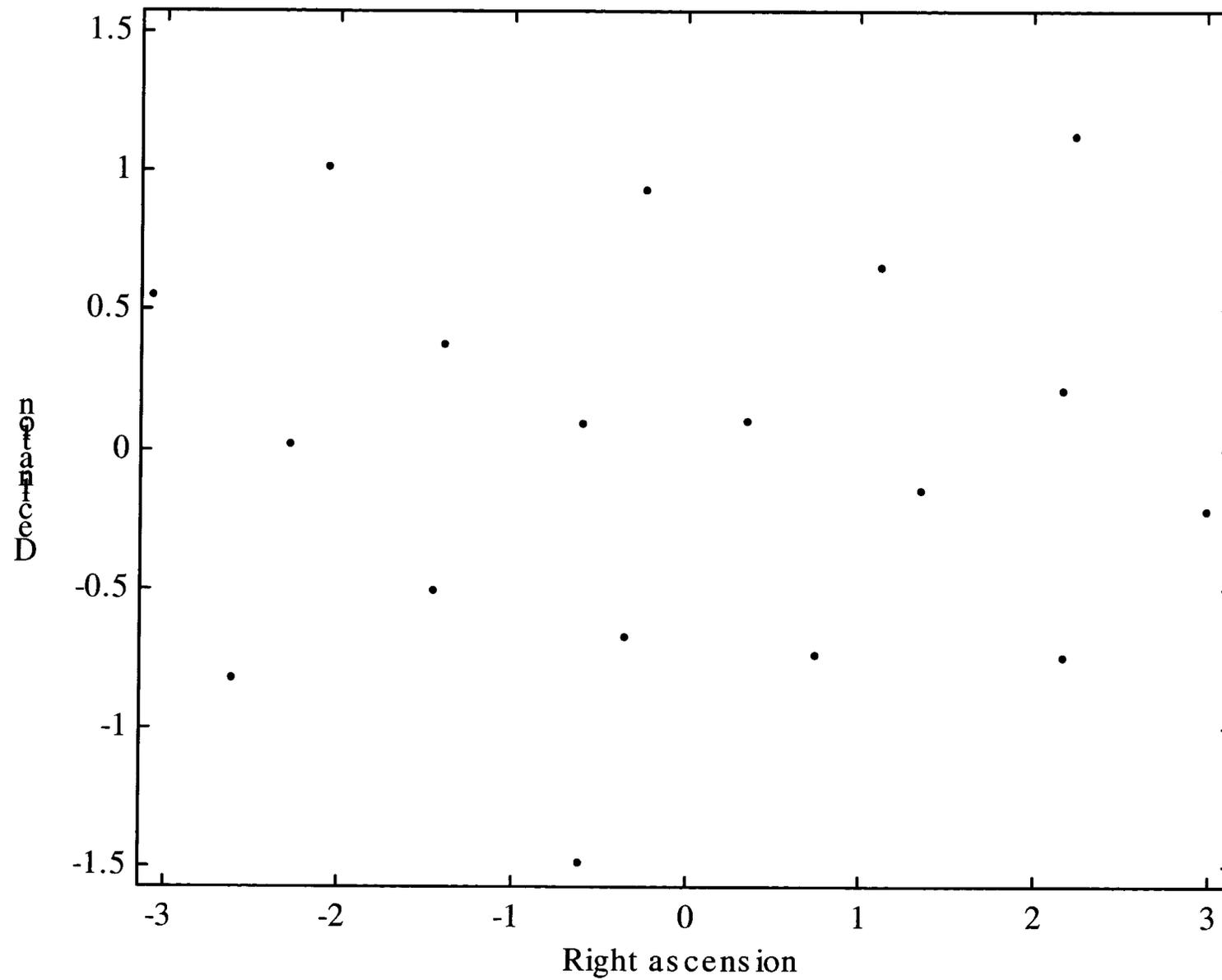
---

# INTRODUCTION



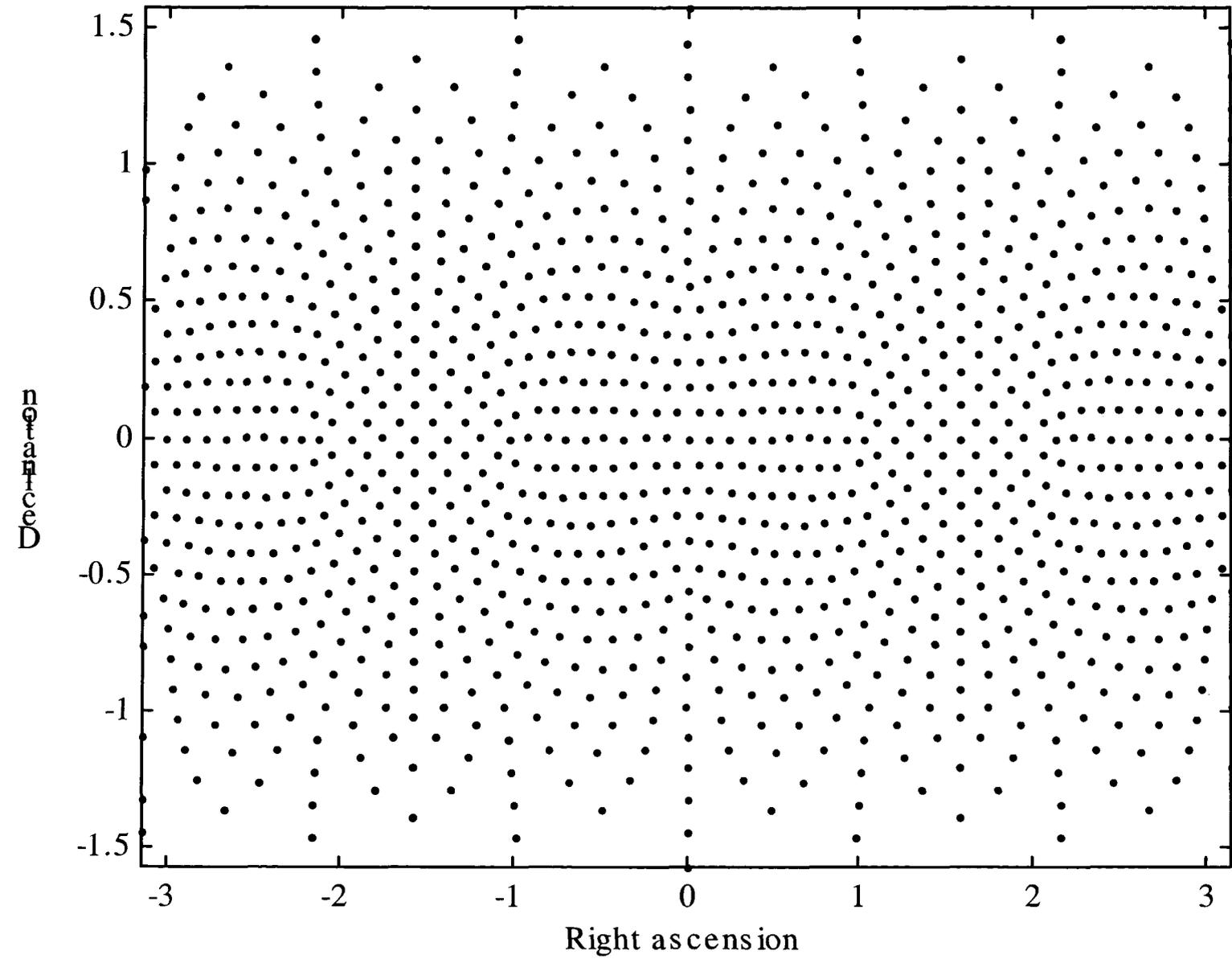


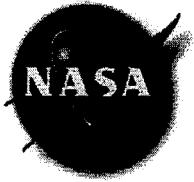
18 points





1082 points

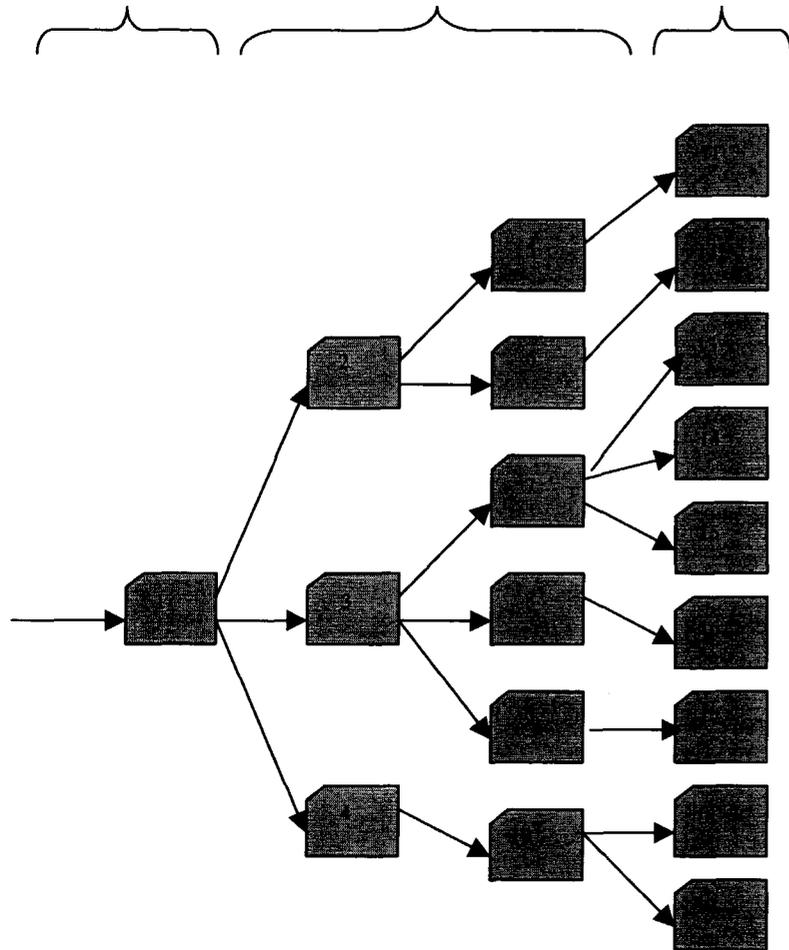




Start element

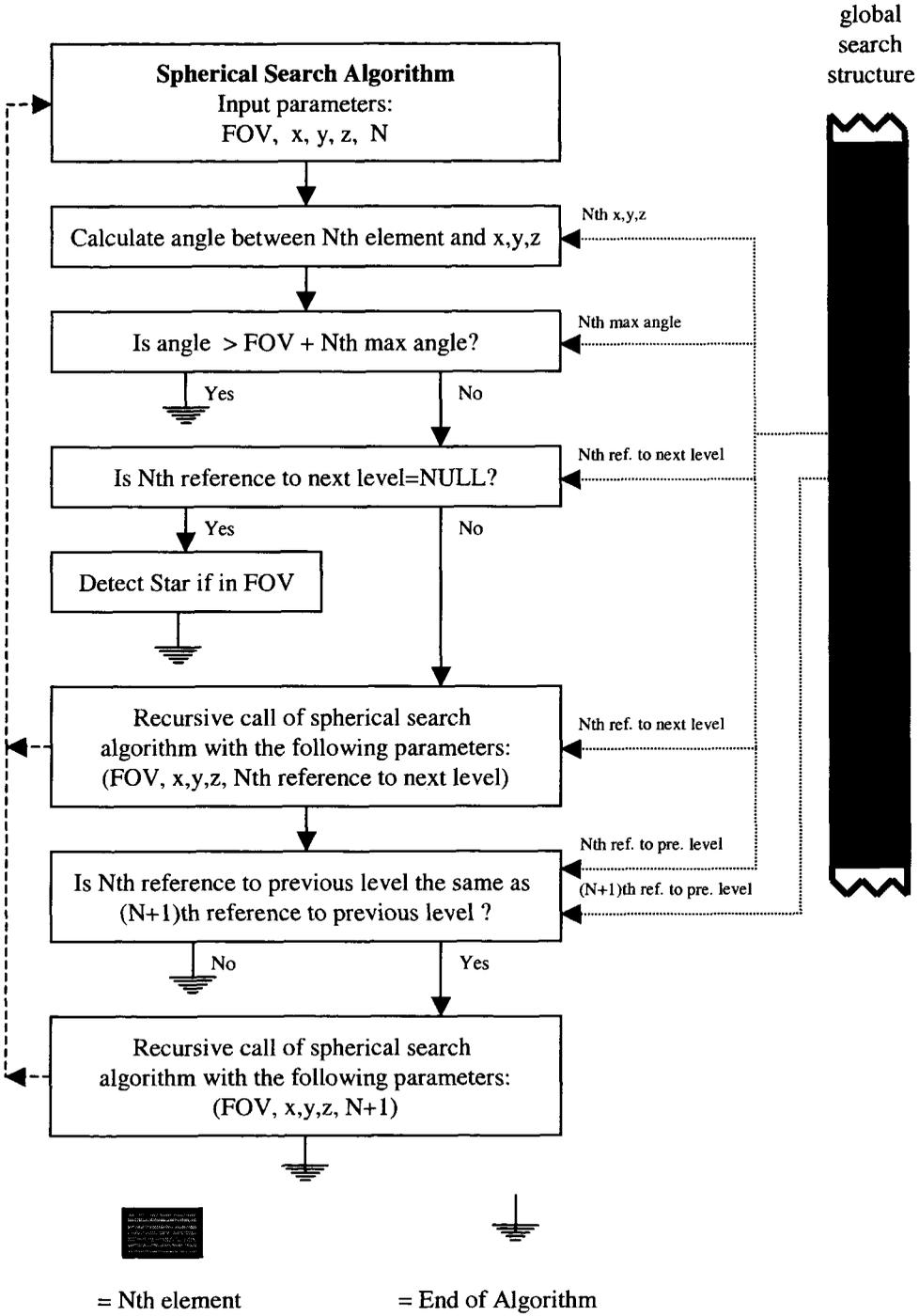
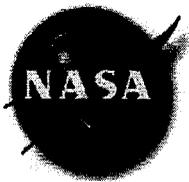
M levels

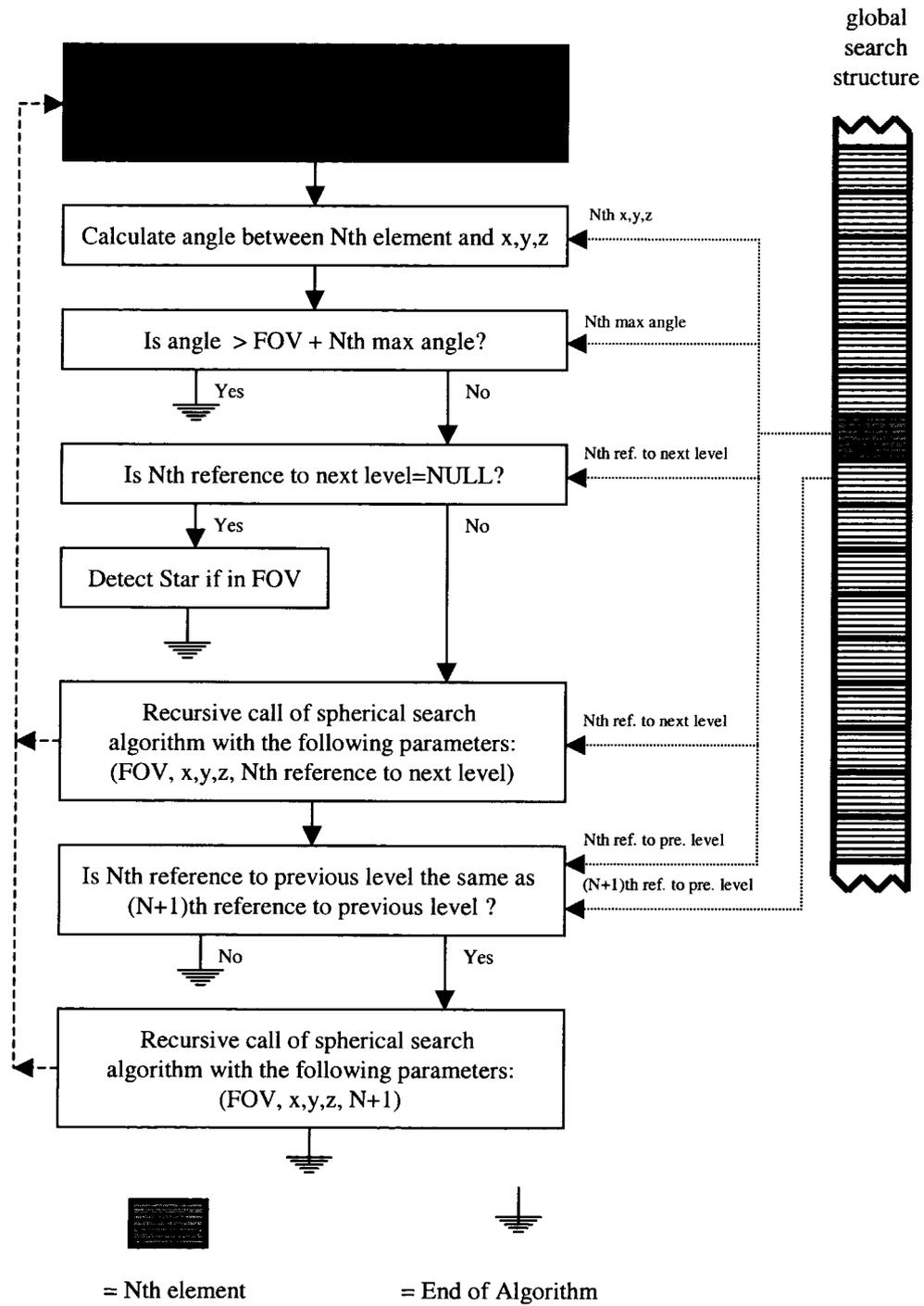
Stars

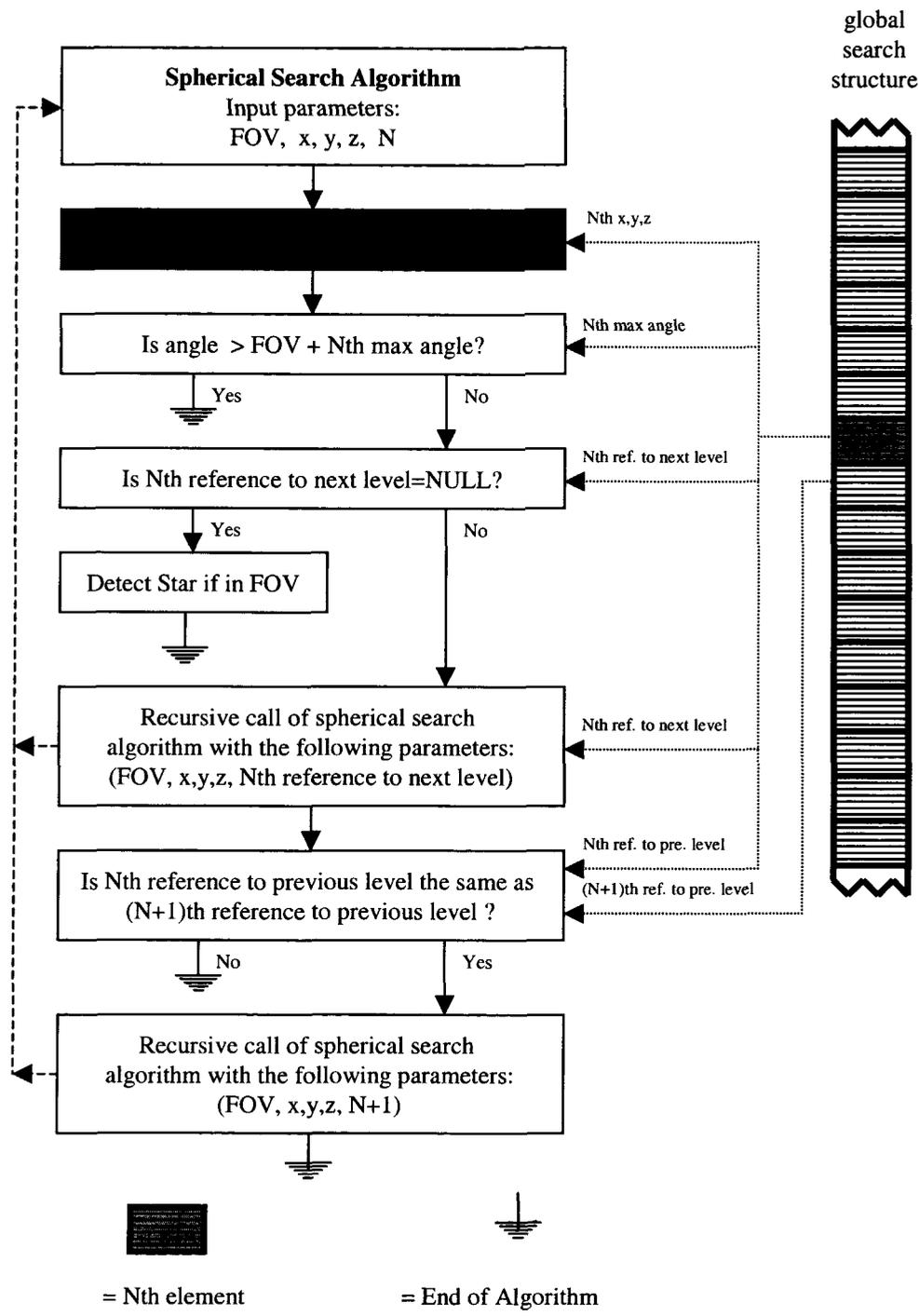
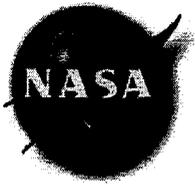


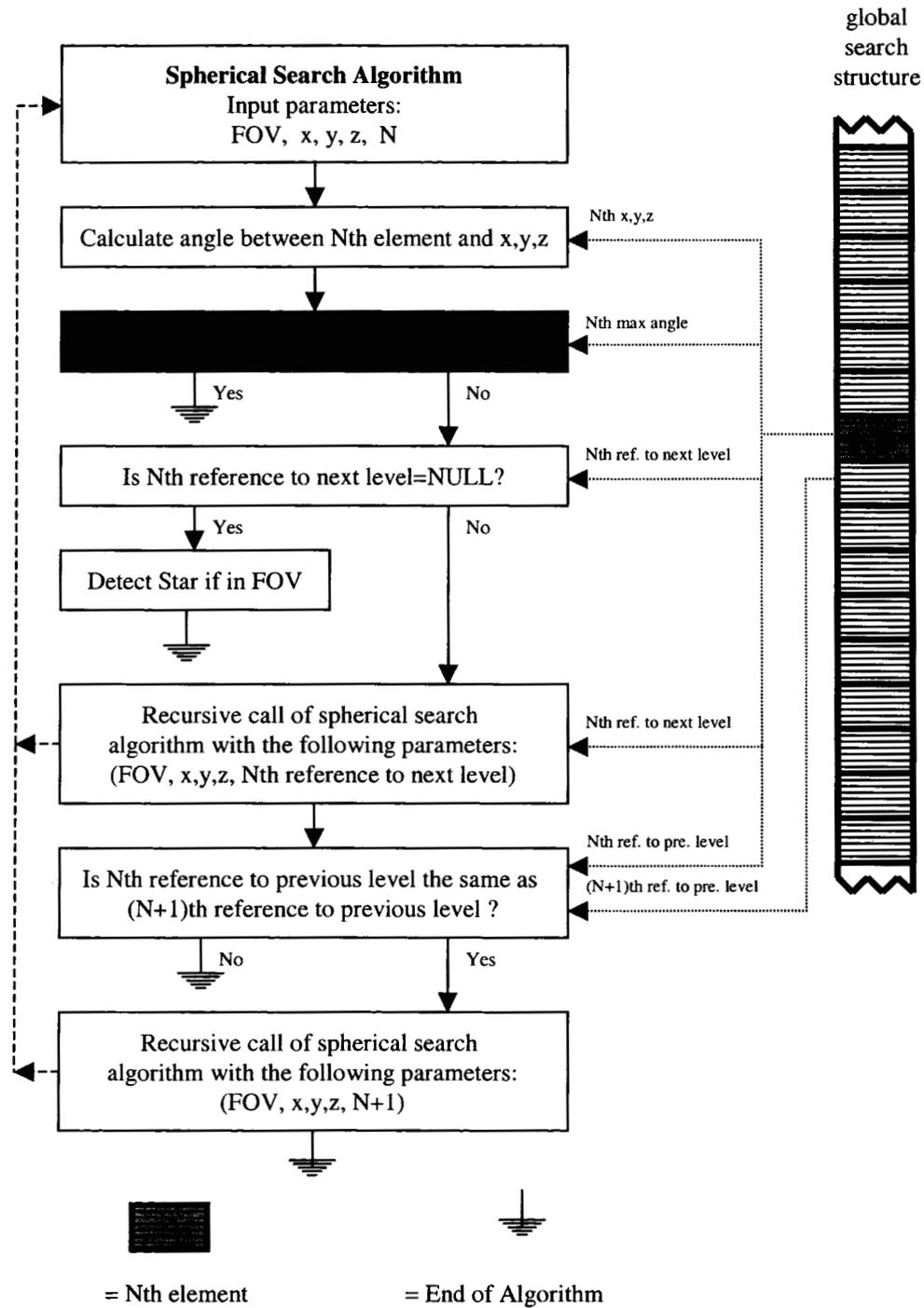
Element X
Unit vector, x component
Unit vector, y component
Unit vector, z component
Angle to most distant element in all sublevels
Reference to element # in previous level
Reference to first element # in next level

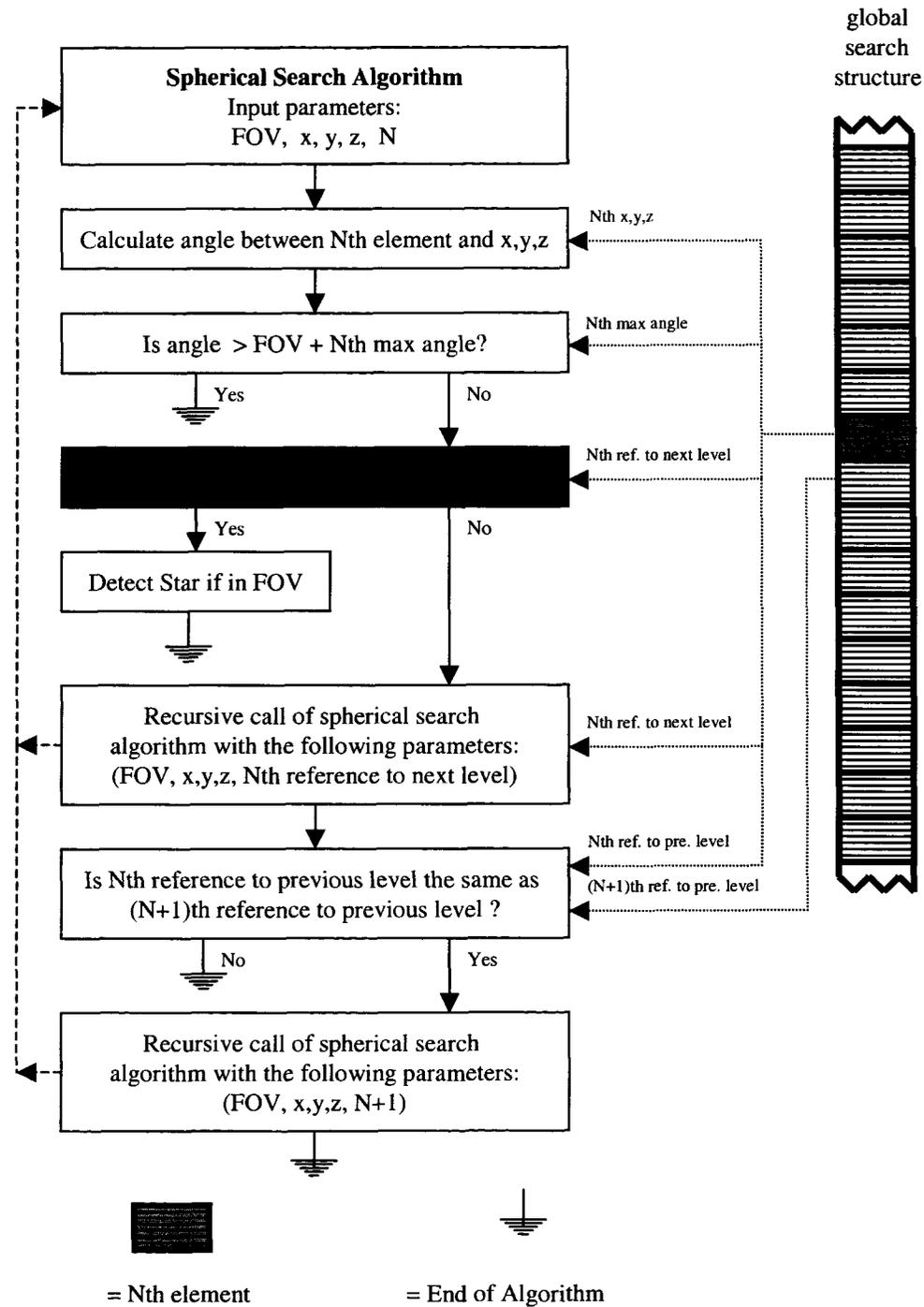


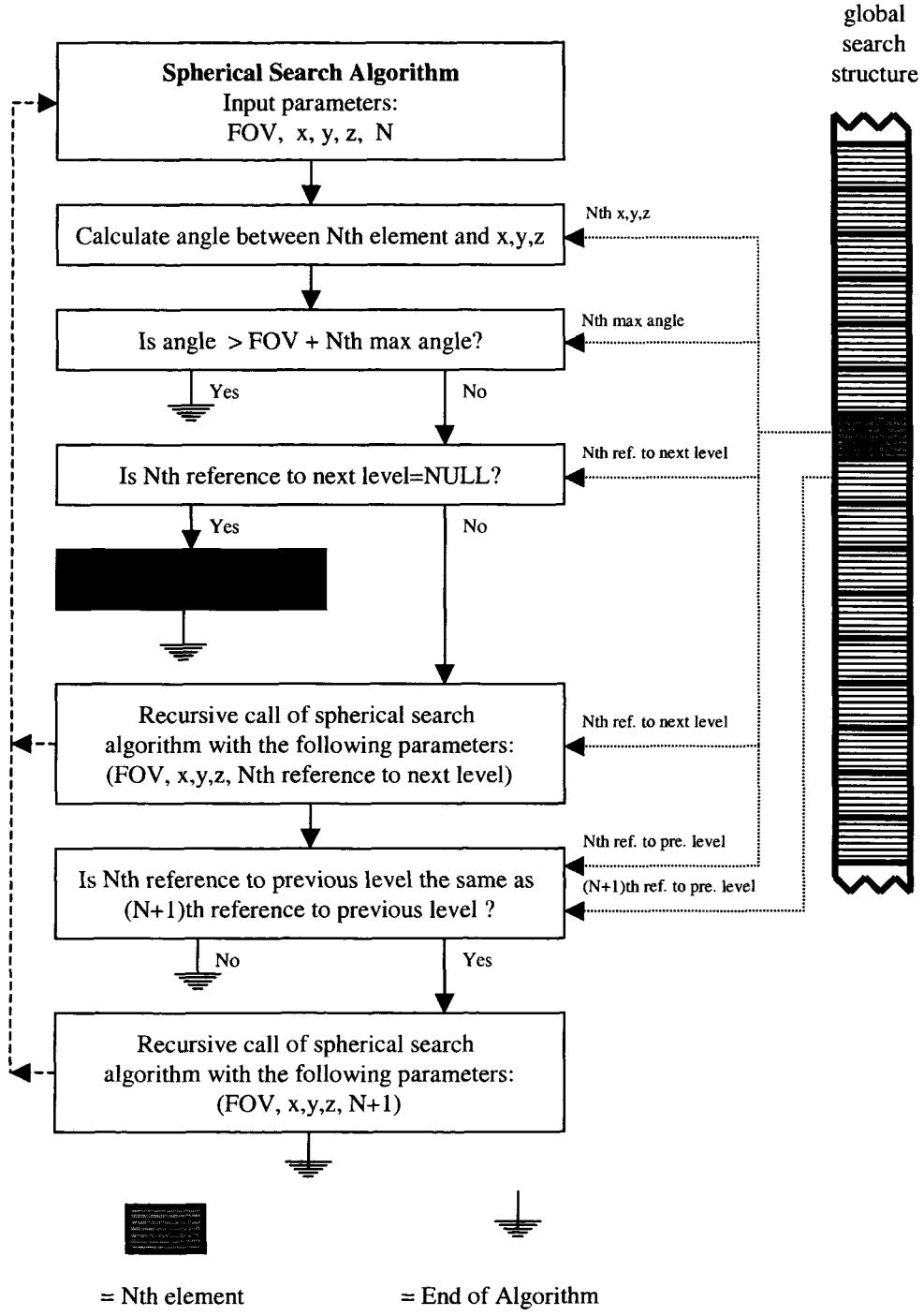
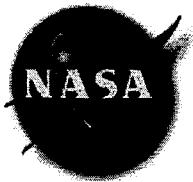


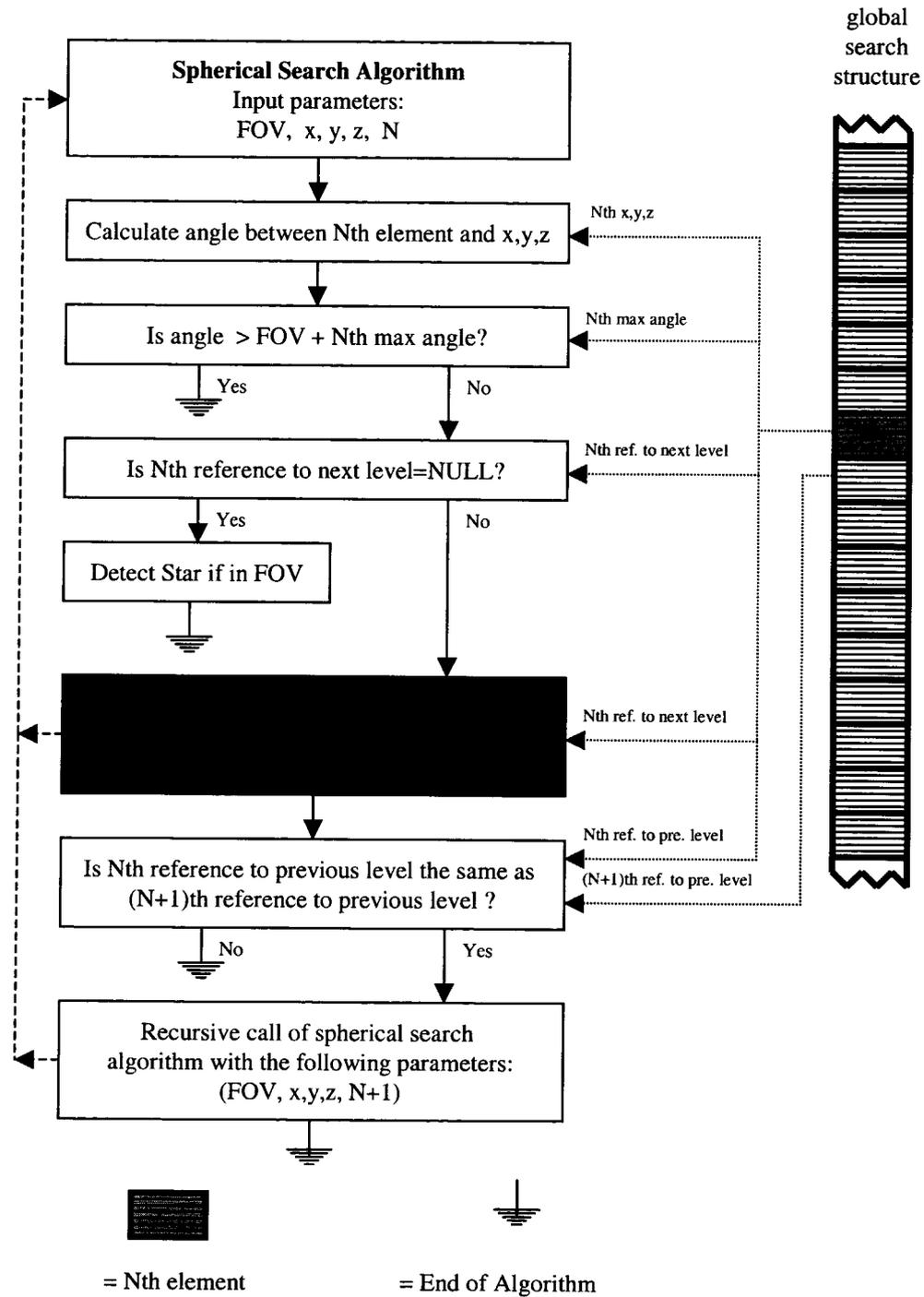
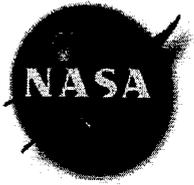


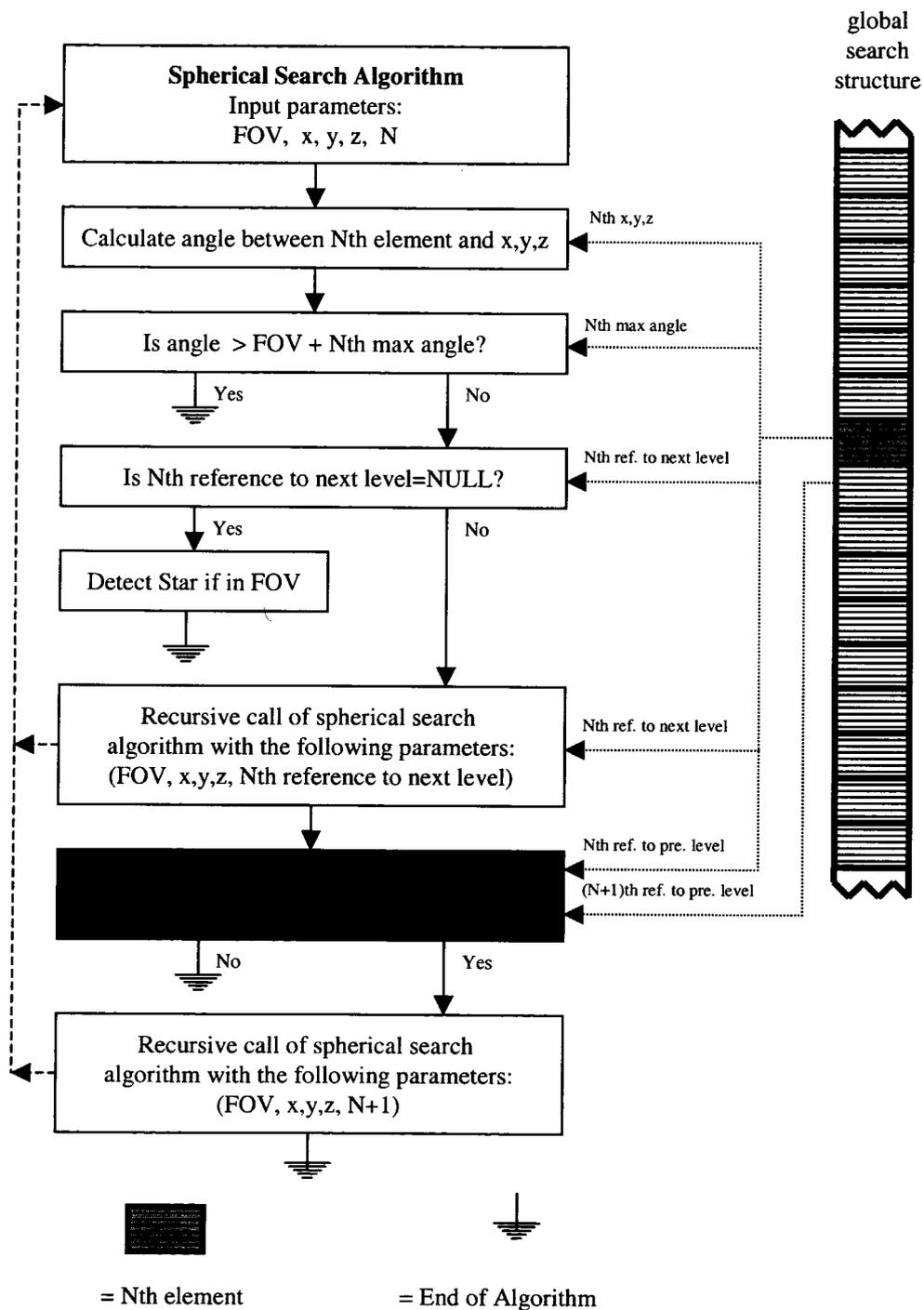


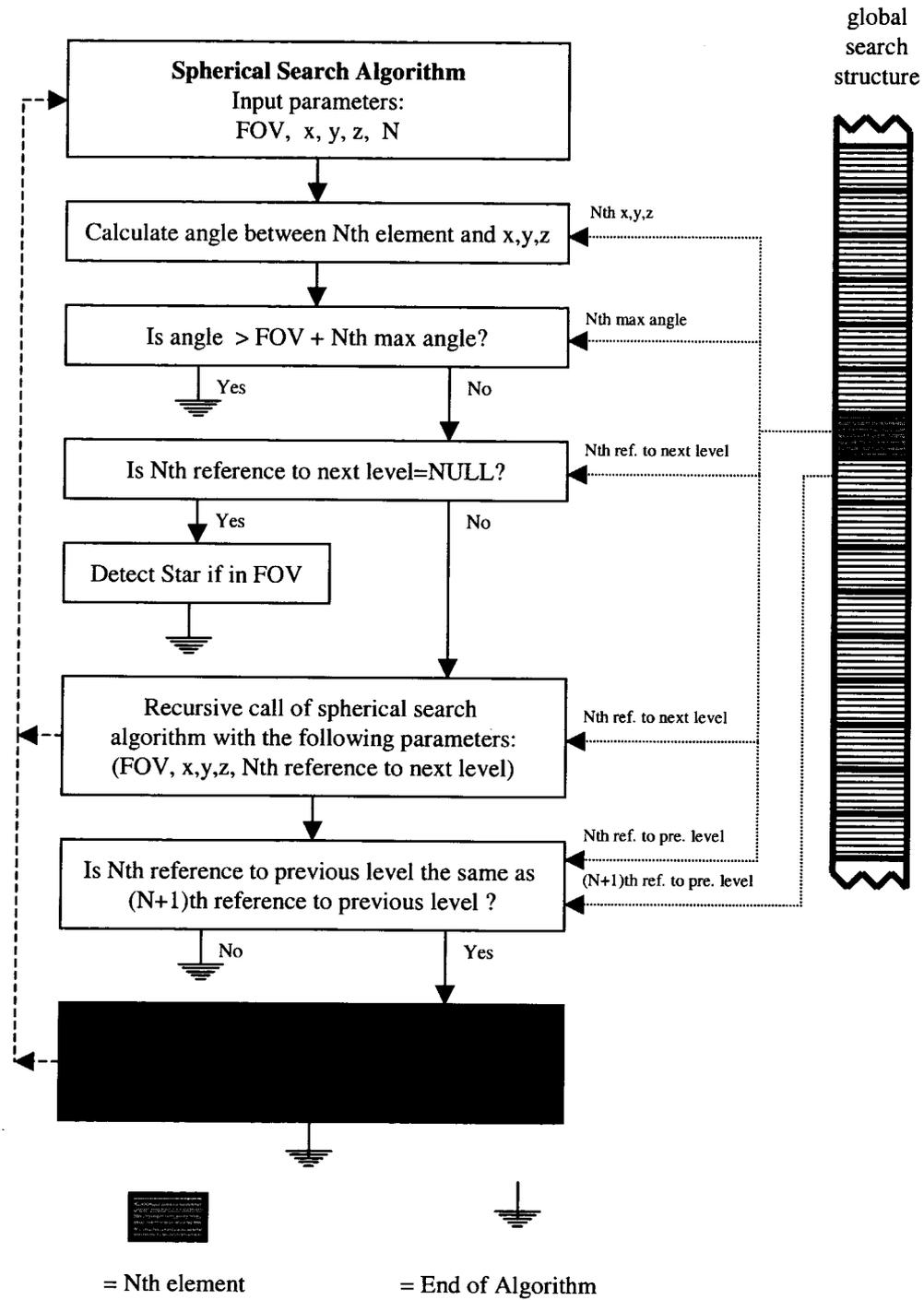
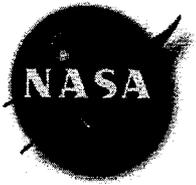


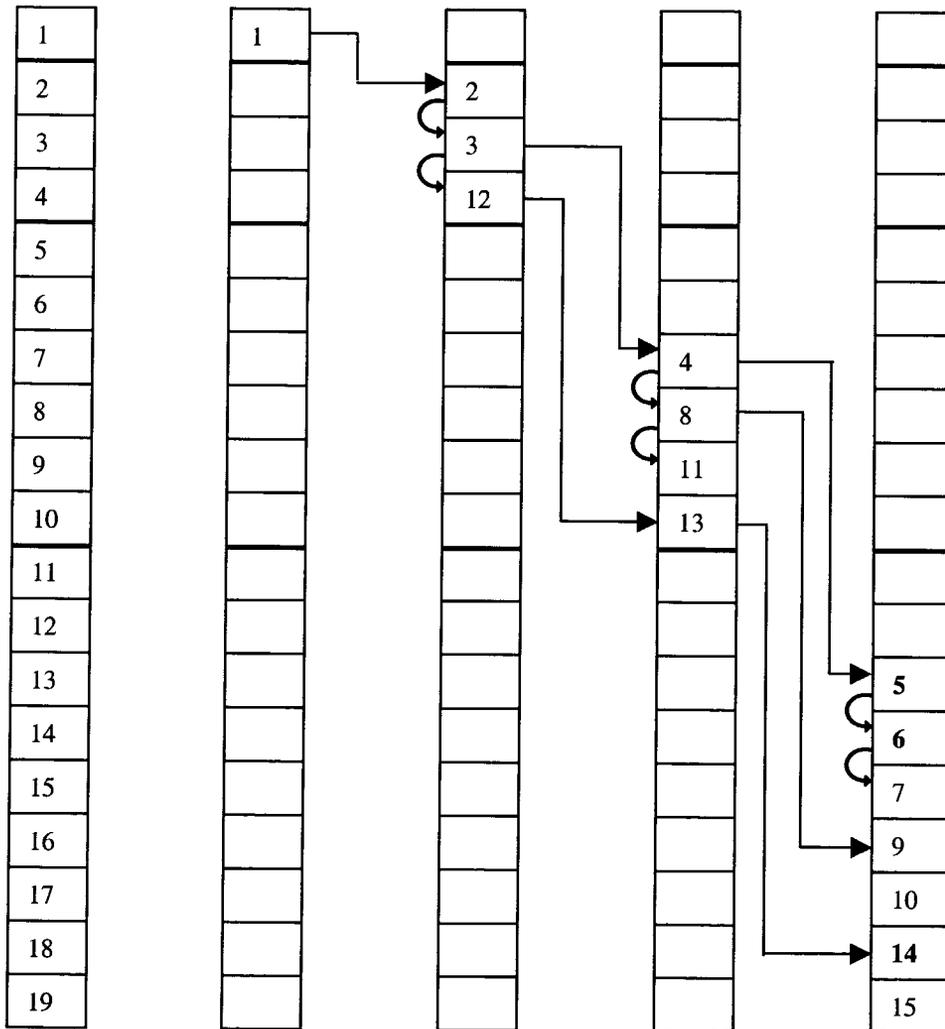














2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19





---

1
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19





1
2
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19





---

1
2
3
4
5
6
8
9
10
11
12
13
14
15
16
17
18
19





1
2
3
4
5
6
7
8
9
10
11
12
14
15
16
17
18
19

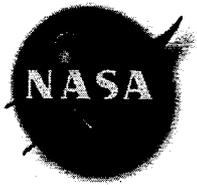




---

1
2
3
4
5
6
7
8
9
10
11
12
13
15
16
17
18
19





---

1
2
3
4
5
6
7
8
9
10
11
12
13
14
16
17
18
19





---

1
2
3
4
5
6
7
9
10
11
12
13
14
15
16
17
18
19





1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
17
18
19





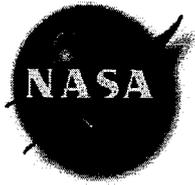
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
18
19





1
2
3
4
5
6
7
8
10
11
12
13
14
15
16
17
18
19





---

1
2
3
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19





---

1
2
3
4
5
6
7
8
9
11
12
13
14
15
16
17
18
19





---

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
19

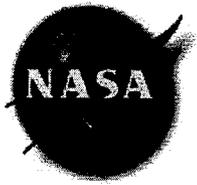




---

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18



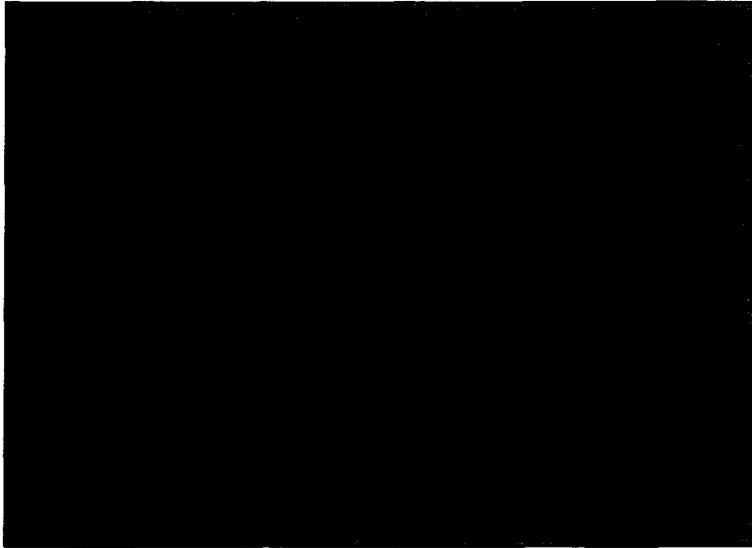


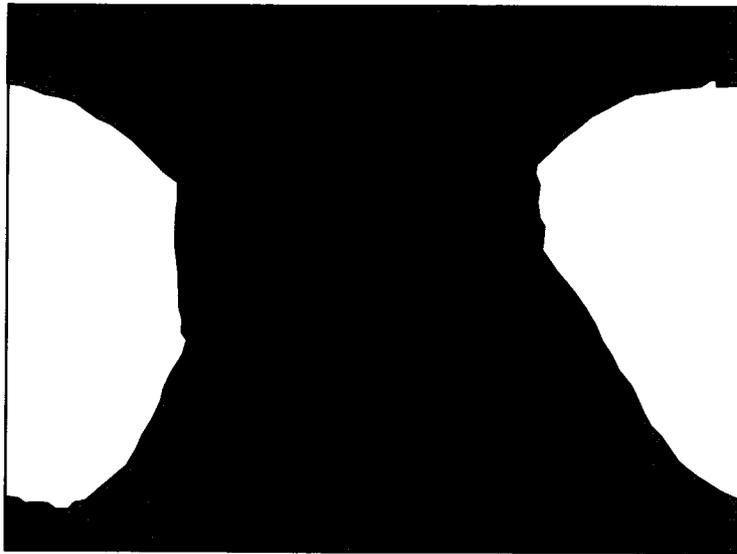
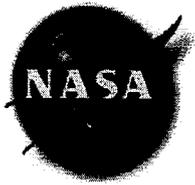
---

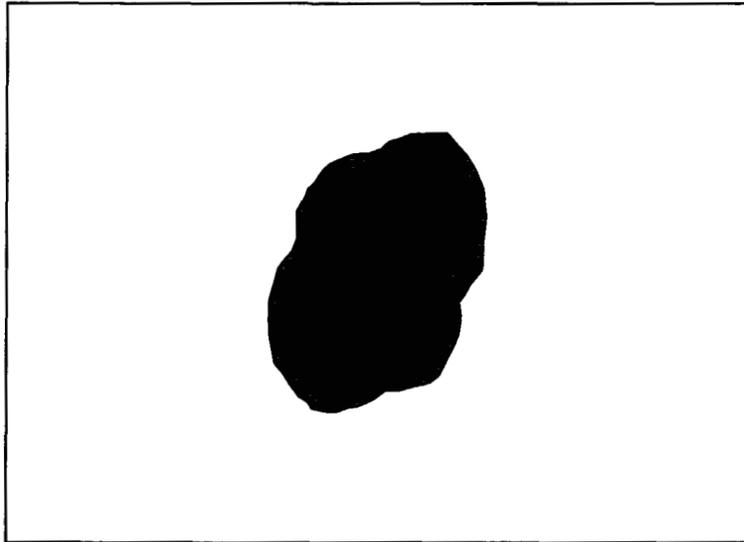
Level	Number of Points	~ Largest angle to star in sublevel (degrees)
Start	1	180.0
1	5	124.9
2	18	61.5
3	72	30.4
4	252	15.3
5	1082	7.2
6	4332	3.3
7	18752	1.4
8	78032	0.5
9	Star catalog	0

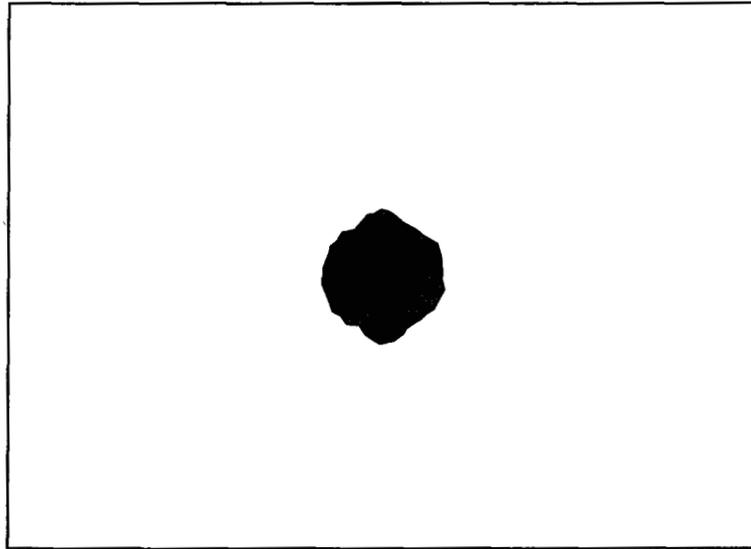
---

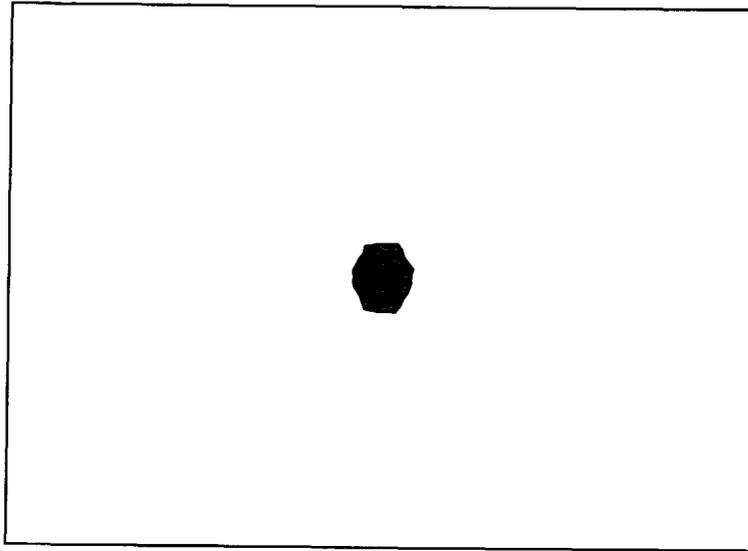


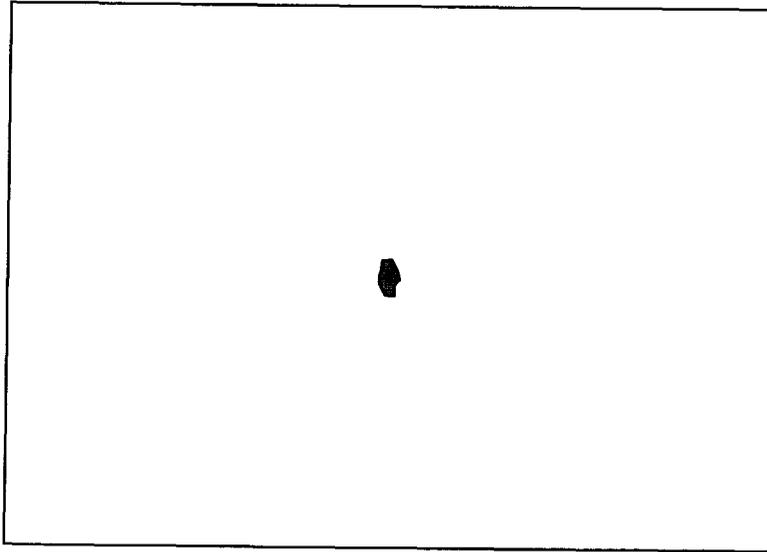
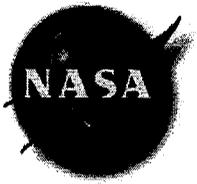


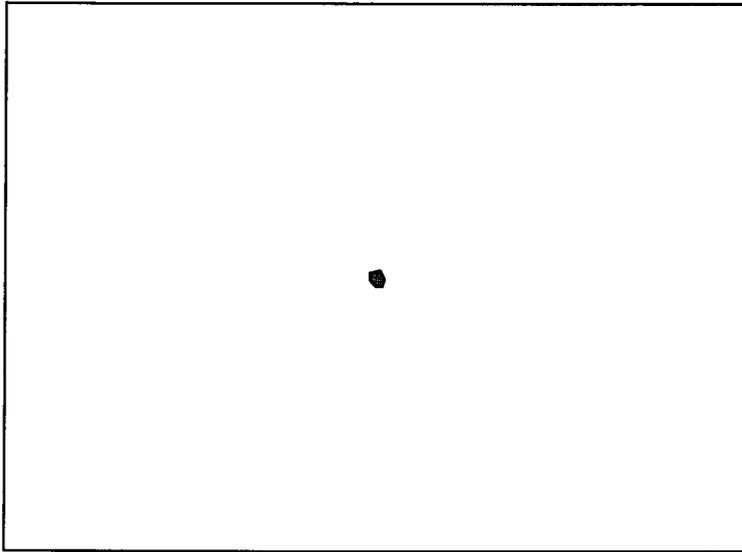
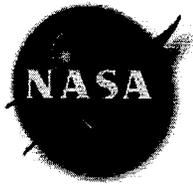


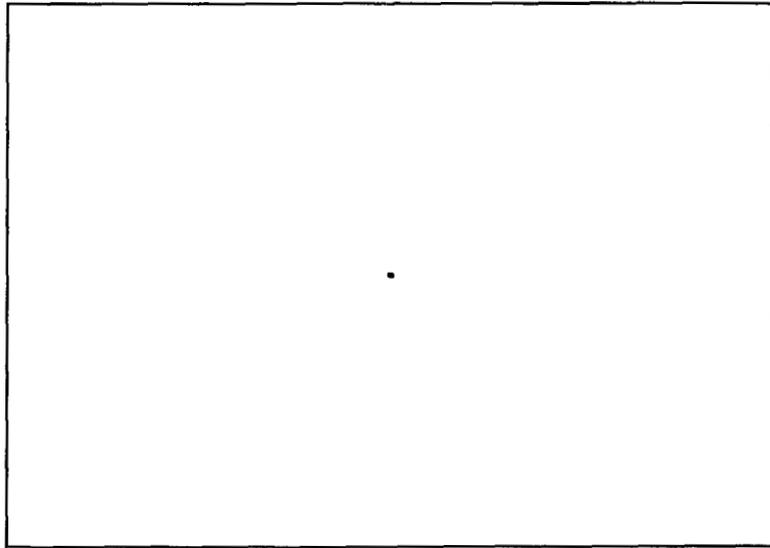














---

# Conclusions

