

# Klein Bottle Horizontal Glued Eigenfunctions of the Graph Laplacian for $M = 2$

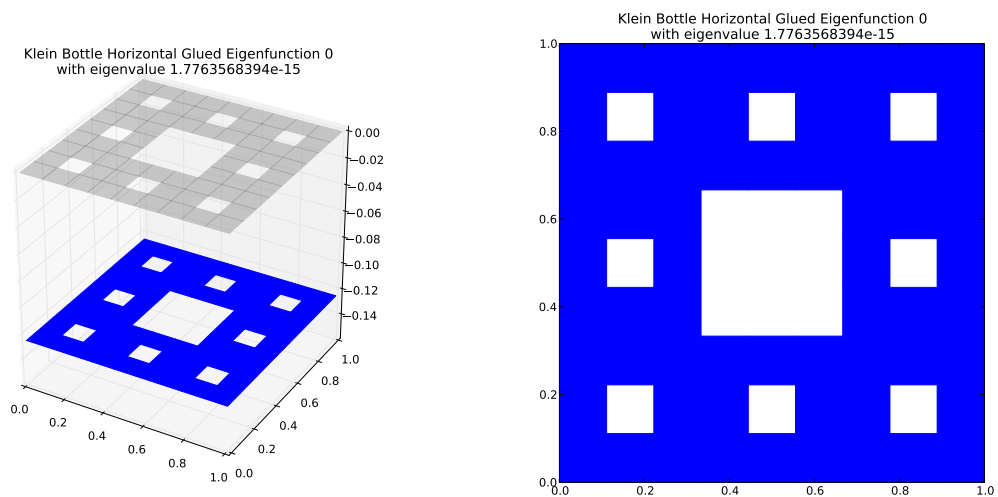
SPUR 2016

August 12, 2016

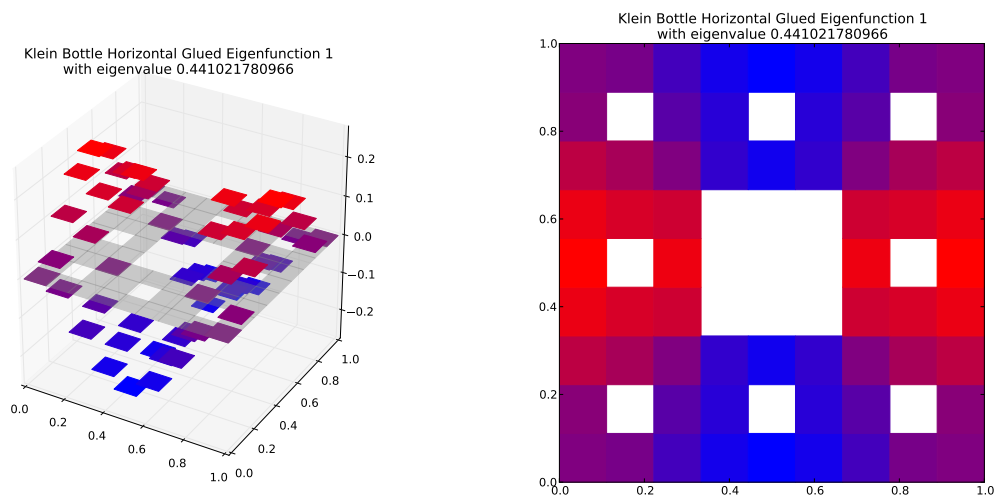
Eigenvalues:

0. 2.42324373966e-15	22. 3.16946673704	44. 5.24180676624
1. 0.441021780966	23. 3.23477240994	45. 5.28160345322
2. 0.690590970621	24. 3.26794919243	46. 5.31502684528
3. 0.757328961658	25. 3.36288406035	47. 5.55157856194
4. 0.758799842469	26. 3.3683025148	48. 5.57257068024
5. 1.12507512074	27. 3.51128162693	49. 5.73371692438
6. 1.48275402202	28. 3.65098985108	50. 5.94691370594
7. 1.49838811955	29. 3.73118391612	51. 6.00016431446
8. 1.56922273818	30. 3.76733918152	52. 6.07534014682
9. 1.86621970714	31. 3.84320023286	53. 6.09573933235
10. 1.87462446692	32. 3.96932301514	54. 6.44874903299
11. 1.88363690629	33. 4.0	55. 6.73205080757
12. 1.92606987712	34. 4.0	56. 6.91189479407
13. 2.0	35. 4.23864505151	57. 7.01403386719
14. 2.03712994973	36. 4.45257105461	58. 7.13083618949
15. 2.32933565713	37. 4.58578643763	59. 7.24963276888
16. 2.41553374839	38. 4.65856481536	60. 7.25326741767
17. 2.78765403799	39. 4.69919119578	61. 7.27082737554
18. 2.92981331722	40. 4.7279682249	62. 7.27755947968
19. 2.98983225608	41. 4.8423550361	63. 7.41421356237
20. 3.03114608259	42. 4.91395612707	
21. 3.06640307644	43. 5.02616265324	

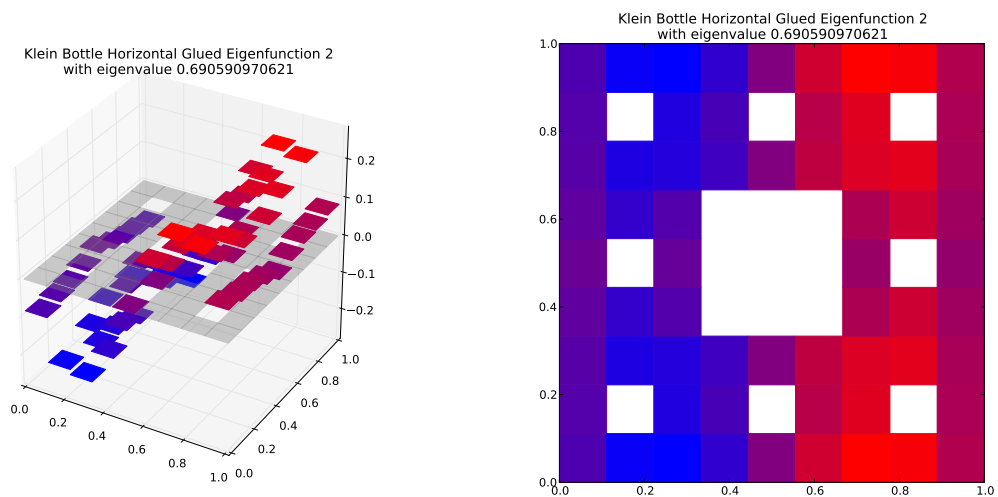
### Eigenfunction 0 with eigenvalue $2.42324373966e-15$



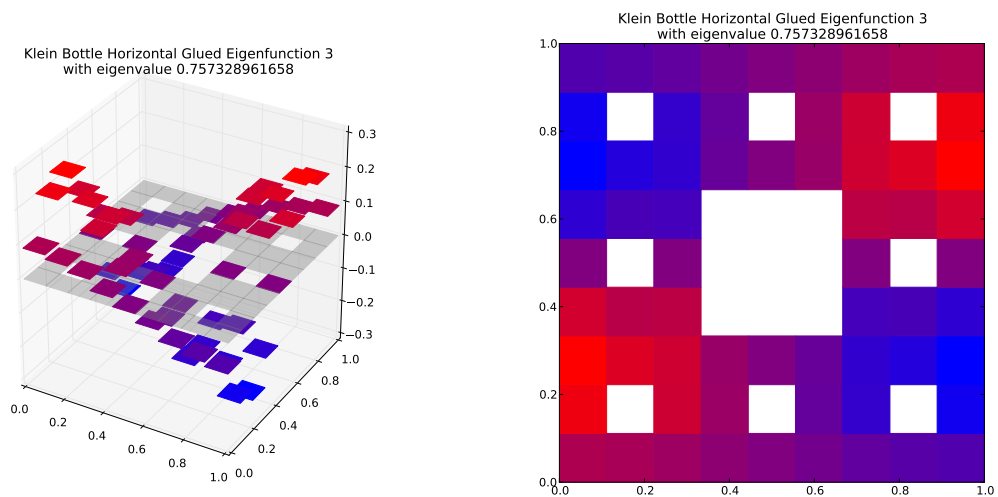
### Eigenfunction 1 with eigenvalue $0.441021780966$



### Eigenfunction 2 with eigenvalue 0.690590970621

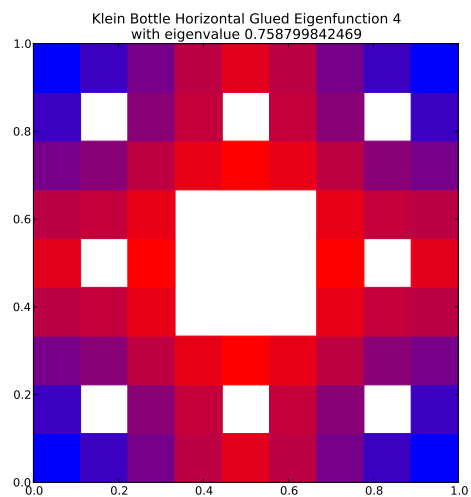
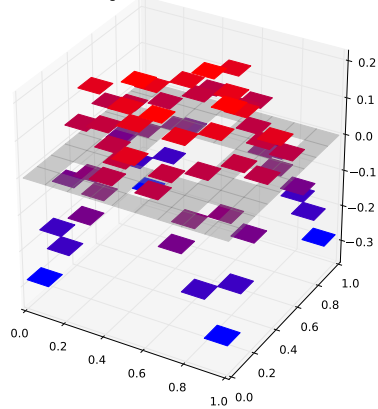


### Eigenfunction 3 with eigenvalue 0.757328961658



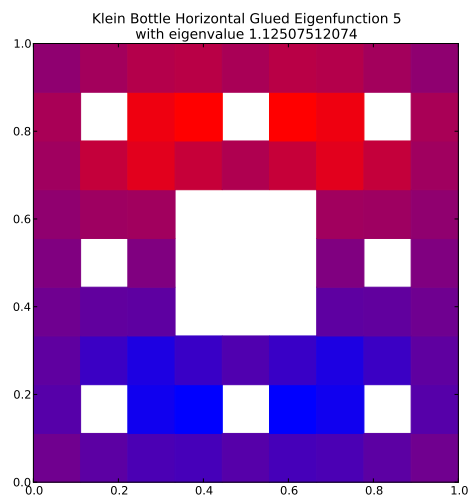
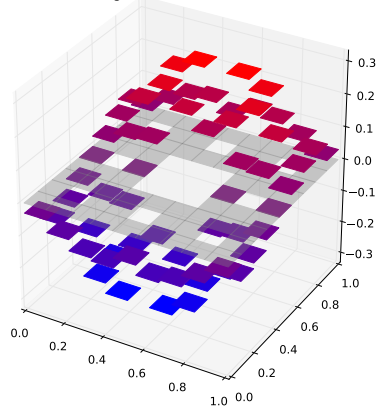
### Eigenfunction 4 with eigenvalue 0.758799842469

Klein Bottle Horizontal Glued Eigenfunction 4  
with eigenvalue 0.758799842469

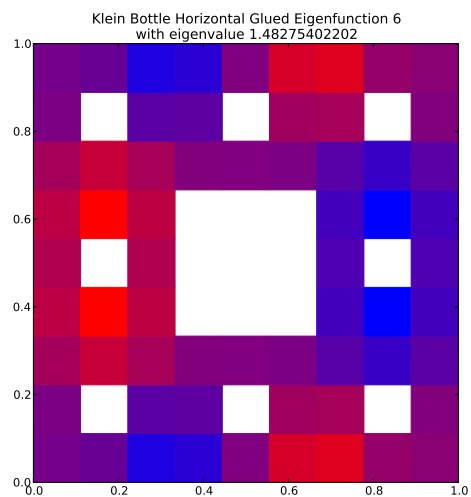
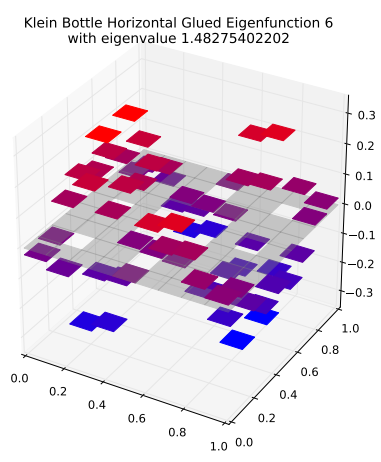


### Eigenfunction 5 with eigenvalue 1.12507512074

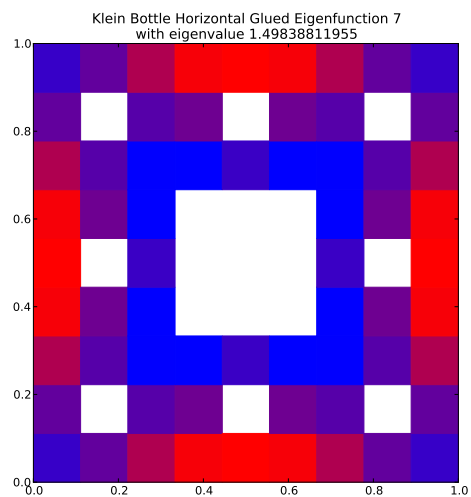
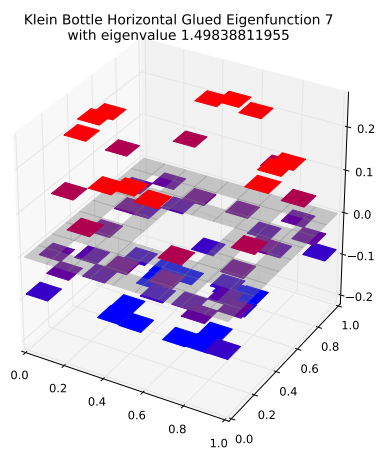
Klein Bottle Horizontal Glued Eigenfunction 5  
with eigenvalue 1.12507512074



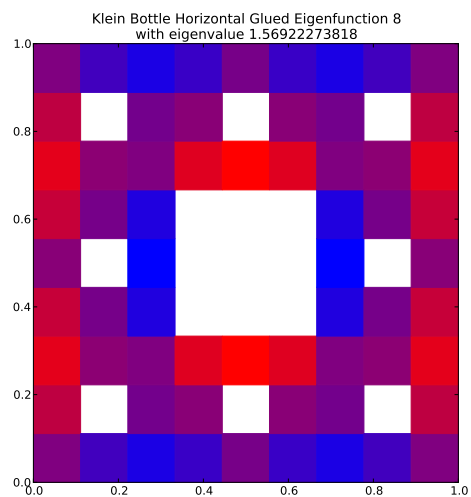
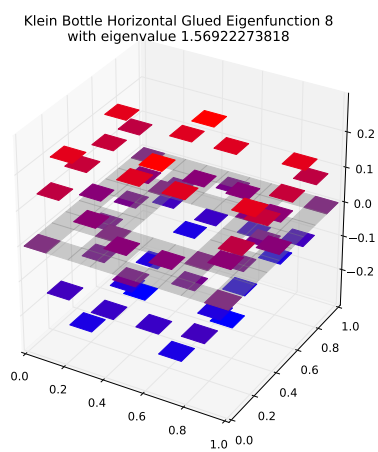
### Eigenfunction 6 with eigenvalue 1.48275402202



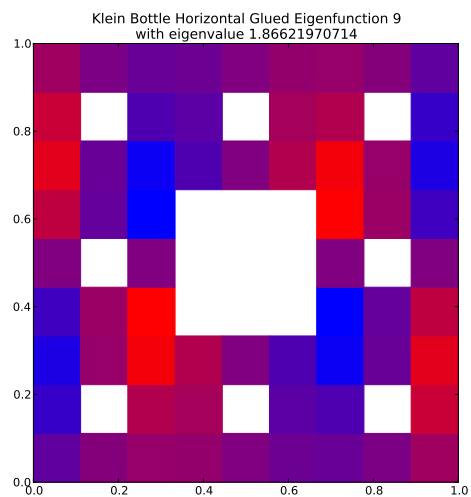
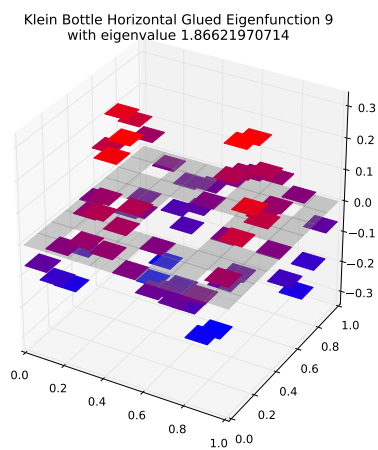
### Eigenfunction 7 with eigenvalue 1.49838811955



### Eigenfunction 8 with eigenvalue 1.56922273818

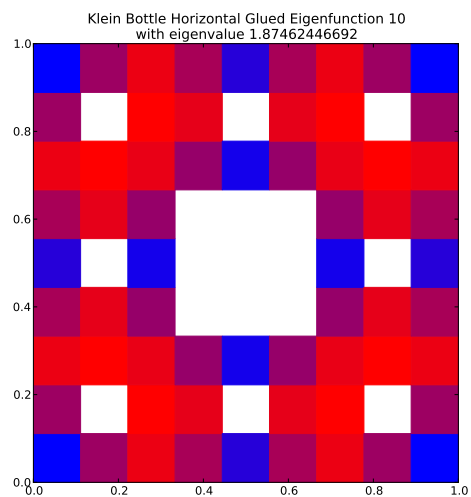
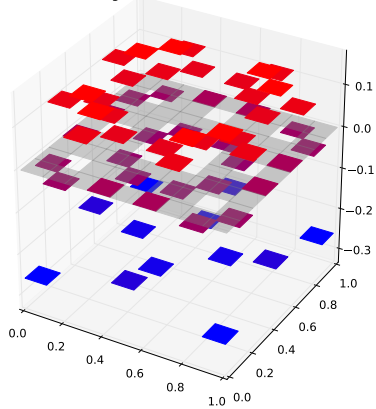


### Eigenfunction 9 with eigenvalue 1.86621970714



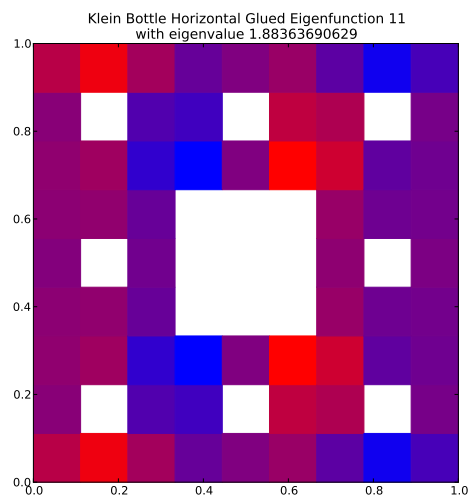
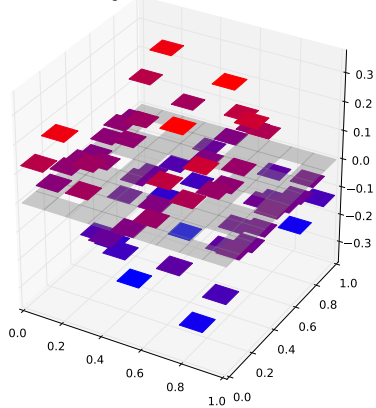
### Eigenfunction 10 with eigenvalue 1.87462446692

Klein Bottle Horizontal Glued Eigenfunction 10  
with eigenvalue 1.87462446692



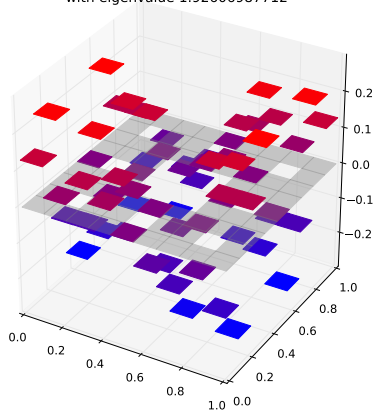
### Eigenfunction 11 with eigenvalue 1.88363690629

Klein Bottle Horizontal Glued Eigenfunction 11  
with eigenvalue 1.88363690629

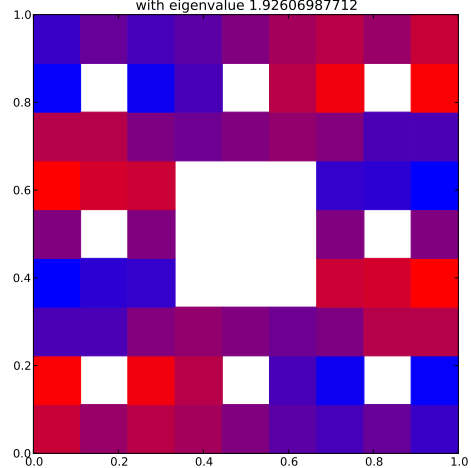


### Eigenfunction 12 with eigenvalue 1.92606987712

Klein Bottle Horizontal Glued Eigenfunction 12  
with eigenvalue 1.92606987712

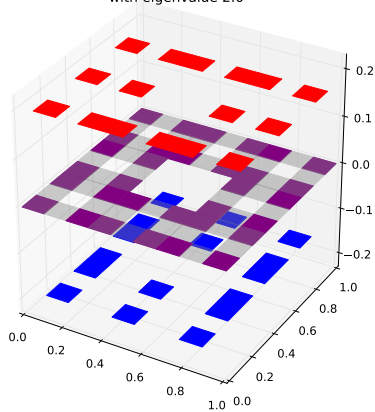


Klein Bottle Horizontal Glued Eigenfunction 12  
with eigenvalue 1.92606987712

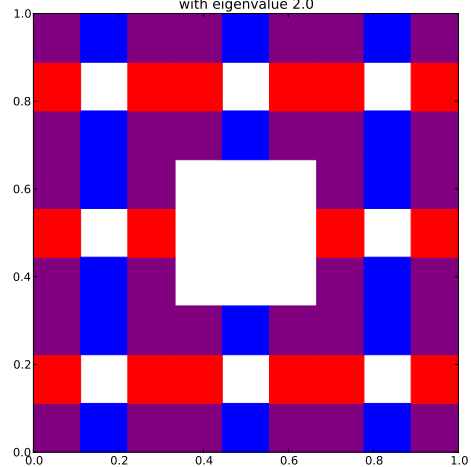


### Eigenfunction 13 with eigenvalue 2.0

Klein Bottle Horizontal Glued Eigenfunction 13  
with eigenvalue 2.0

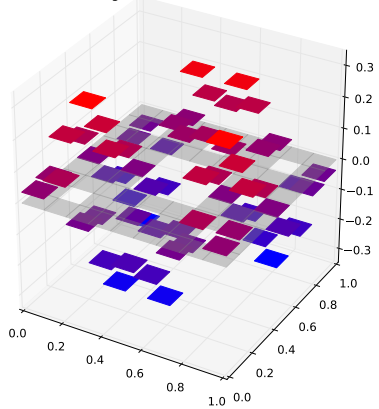


Klein Bottle Horizontal Glued Eigenfunction 13  
with eigenvalue 2.0

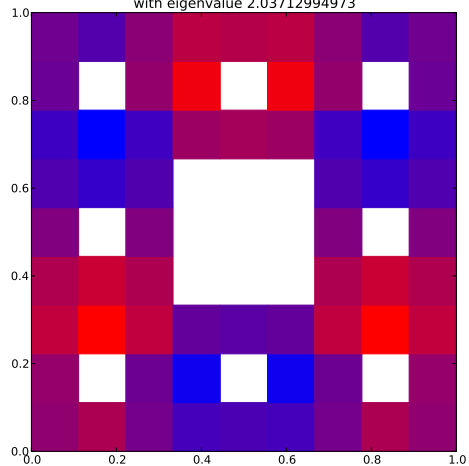


### Eigenfunction 14 with eigenvalue 2.03712994973

Klein Bottle Horizontal Glued Eigenfunction 14  
with eigenvalue 2.03712994973

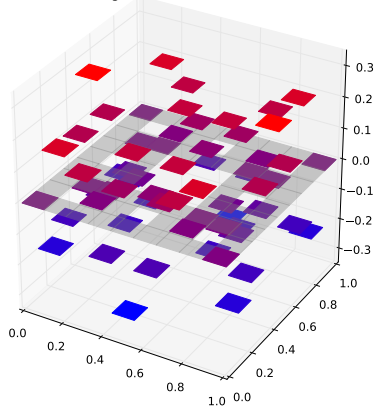


Klein Bottle Horizontal Glued Eigenfunction 14  
with eigenvalue 2.03712994973

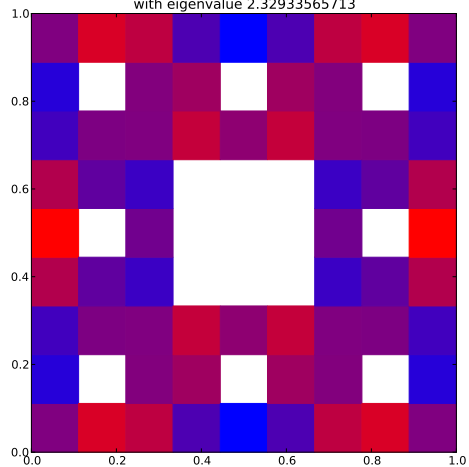


### Eigenfunction 15 with eigenvalue 2.32933565713

Klein Bottle Horizontal Glued Eigenfunction 15  
with eigenvalue 2.32933565713

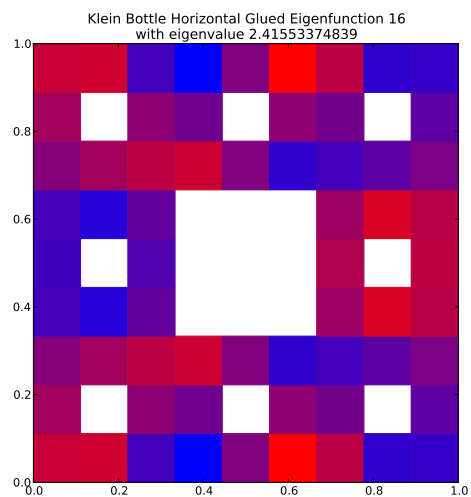
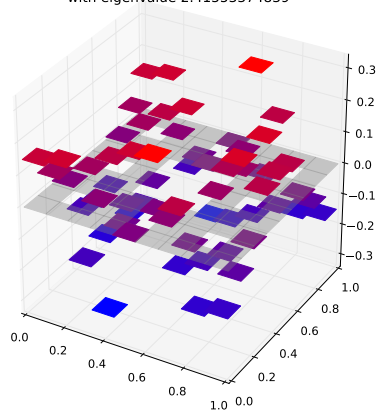


Klein Bottle Horizontal Glued Eigenfunction 15  
with eigenvalue 2.32933565713



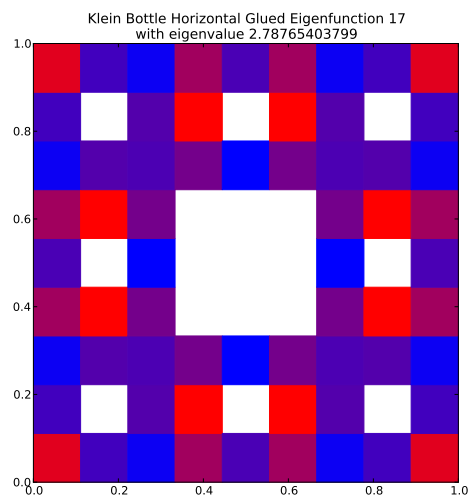
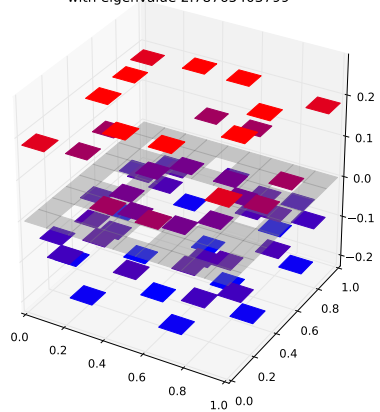
### Eigenfunction 16 with eigenvalue 2.41553374839

Klein Bottle Horizontal Glued Eigenfunction 16  
with eigenvalue 2.41553374839



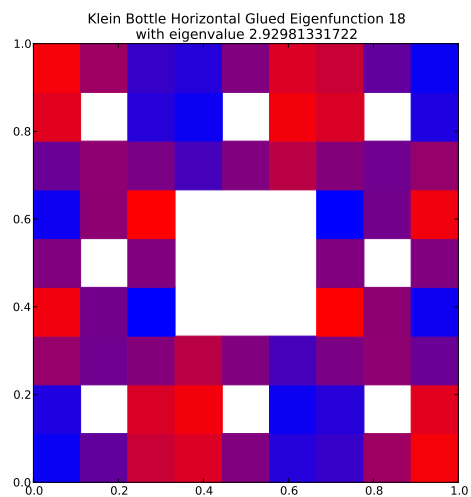
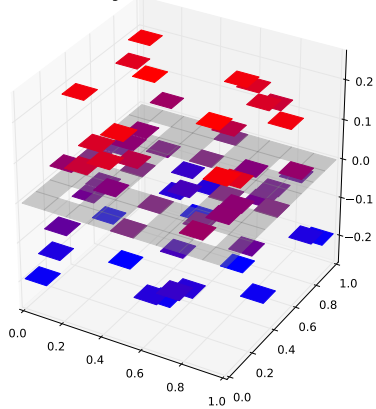
### Eigenfunction 17 with eigenvalue 2.78765403799

Klein Bottle Horizontal Glued Eigenfunction 17  
with eigenvalue 2.78765403799



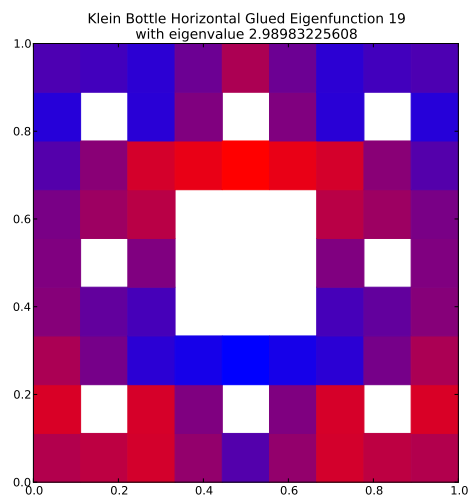
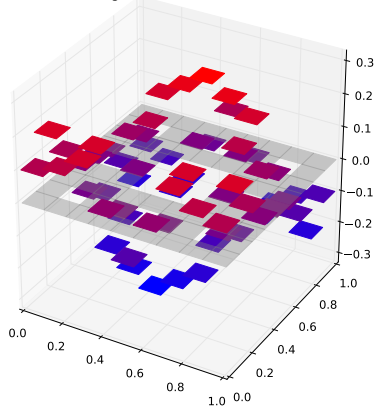
### Eigenfunction 18 with eigenvalue 2.92981331722

Klein Bottle Horizontal Glued Eigenfunction 18  
with eigenvalue 2.92981331722



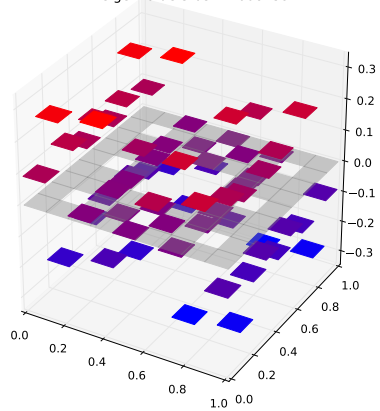
### Eigenfunction 19 with eigenvalue 2.98983225608

Klein Bottle Horizontal Glued Eigenfunction 19  
with eigenvalue 2.98983225608

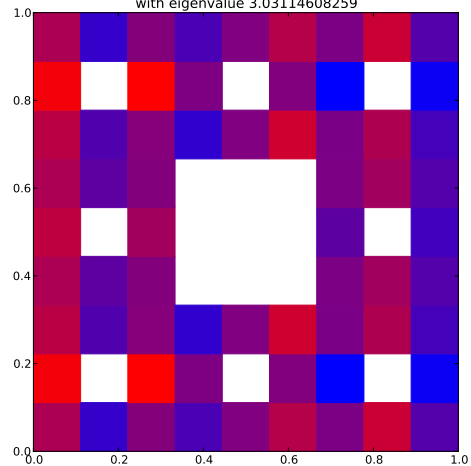


### Eigenfunction 20 with eigenvalue 3.03114608259

Klein Bottle Horizontal Glued Eigenfunction 20  
with eigenvalue 3.03114608259

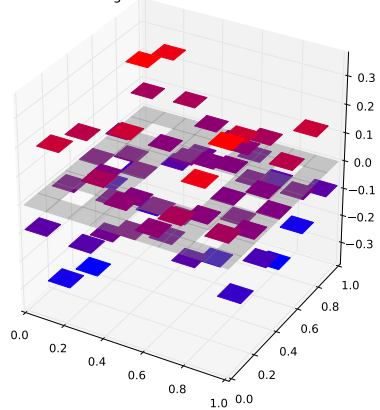


Klein Bottle Horizontal Glued Eigenfunction 20  
with eigenvalue 3.03114608259

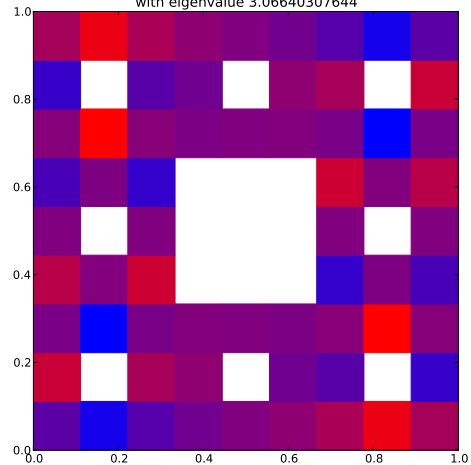


### Eigenfunction 21 with eigenvalue 3.06640307644

Klein Bottle Horizontal Glued Eigenfunction 21  
with eigenvalue 3.06640307644

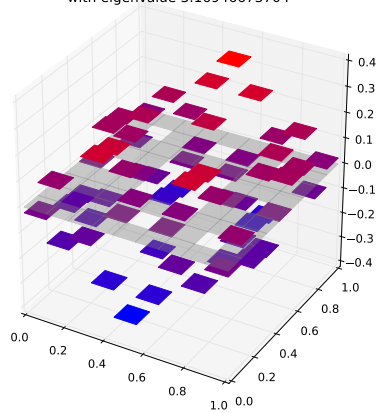


Klein Bottle Horizontal Glued Eigenfunction 21  
with eigenvalue 3.06640307644

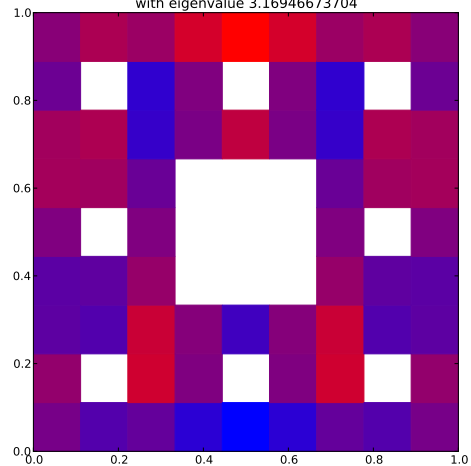


### Eigenfunction 22 with eigenvalue 3.16946673704

Klein Bottle Horizontal Glued Eigenfunction 22  
with eigenvalue 3.16946673704

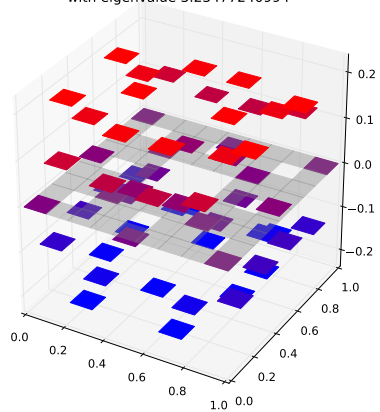


Klein Bottle Horizontal Glued Eigenfunction 22  
with eigenvalue 3.16946673704

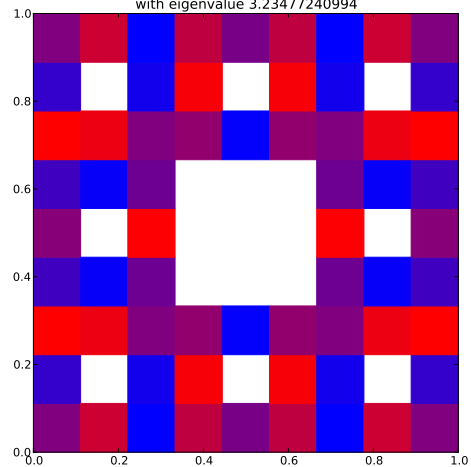


### Eigenfunction 23 with eigenvalue 3.23477240994

Klein Bottle Horizontal Glued Eigenfunction 23  
with eigenvalue 3.23477240994

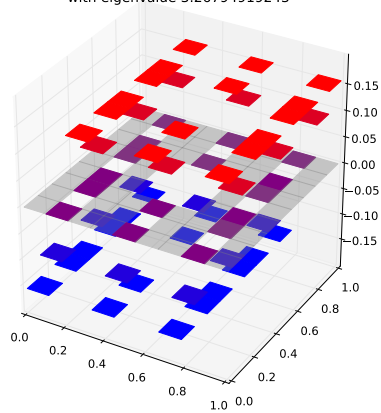


Klein Bottle Horizontal Glued Eigenfunction 23  
with eigenvalue 3.23477240994

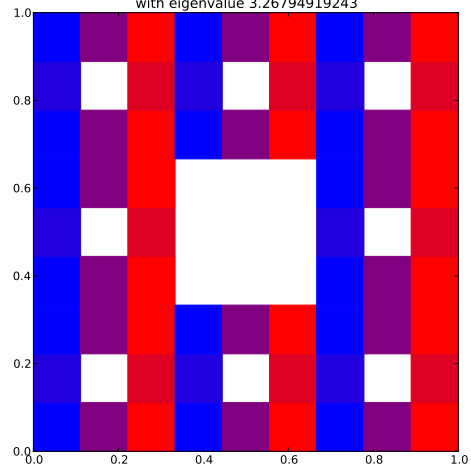


### Eigenfunction 24 with eigenvalue 3.26794919243

Klein Bottle Horizontal Glued Eigenfunction 24  
with eigenvalue 3.26794919243

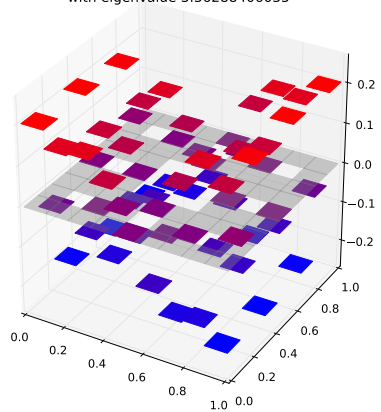


Klein Bottle Horizontal Glued Eigenfunction 24  
with eigenvalue 3.26794919243

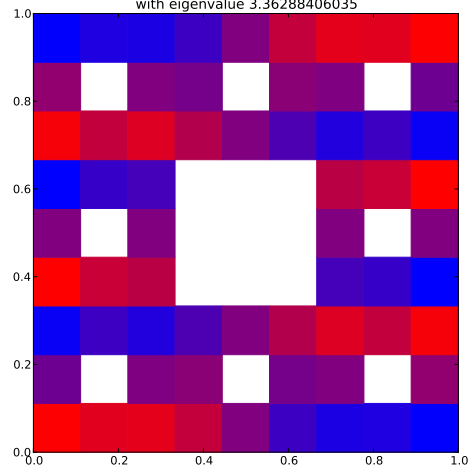


### Eigenfunction 25 with eigenvalue 3.36288406035

Klein Bottle Horizontal Glued Eigenfunction 25  
with eigenvalue 3.36288406035

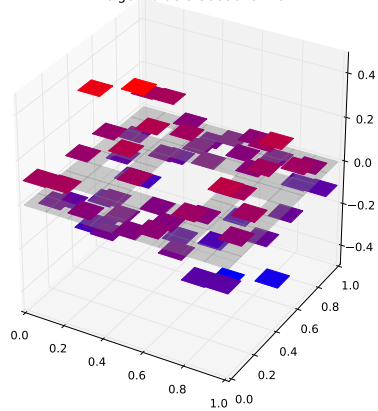


Klein Bottle Horizontal Glued Eigenfunction 25  
with eigenvalue 3.36288406035

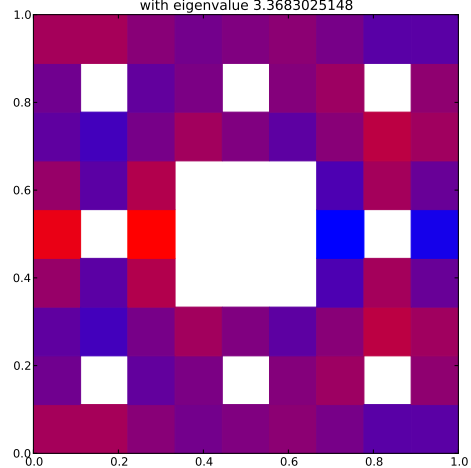


### Eigenfunction 26 with eigenvalue 3.3683025148

Klein Bottle Horizontal Glued Eigenfunction 26  
with eigenvalue 3.3683025148

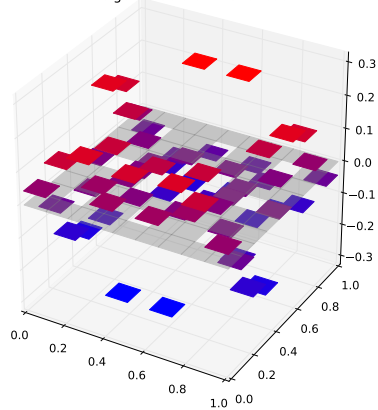


Klein Bottle Horizontal Glued Eigenfunction 26  
with eigenvalue 3.3683025148

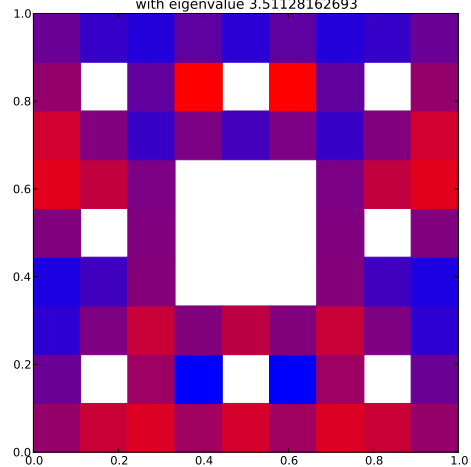


### Eigenfunction 27 with eigenvalue 3.51128162693

Klein Bottle Horizontal Glued Eigenfunction 27  
with eigenvalue 3.51128162693

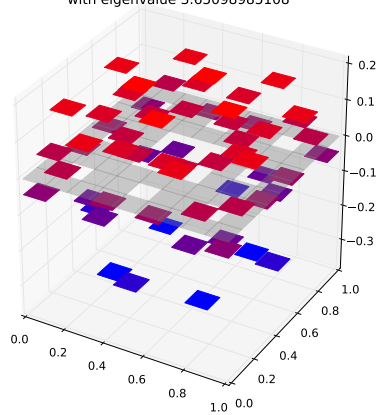


Klein Bottle Horizontal Glued Eigenfunction 27  
with eigenvalue 3.51128162693

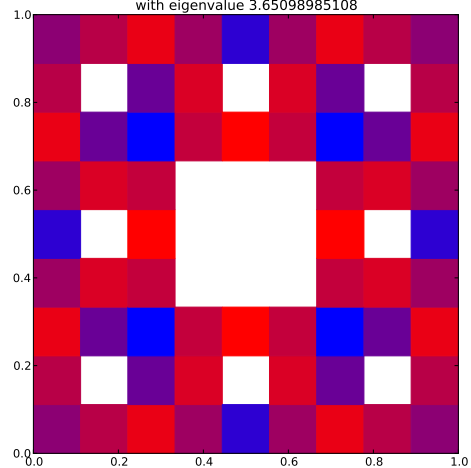


### Eigenfunction 28 with eigenvalue 3.65098985108

Klein Bottle Horizontal Glued Eigenfunction 28  
with eigenvalue 3.65098985108

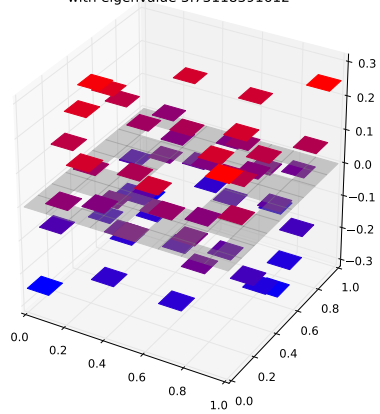


Klein Bottle Horizontal Glued Eigenfunction 28  
with eigenvalue 3.65098985108

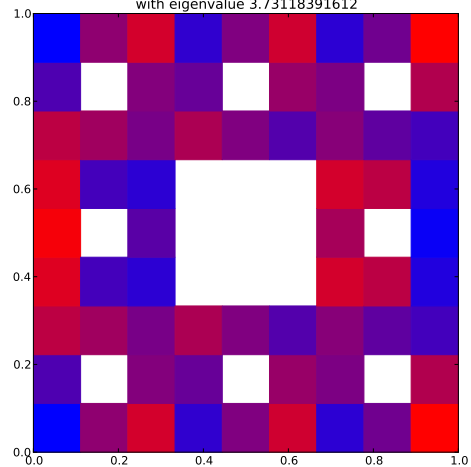


### Eigenfunction 29 with eigenvalue 3.73118391612

Klein Bottle Horizontal Glued Eigenfunction 29  
with eigenvalue 3.73118391612

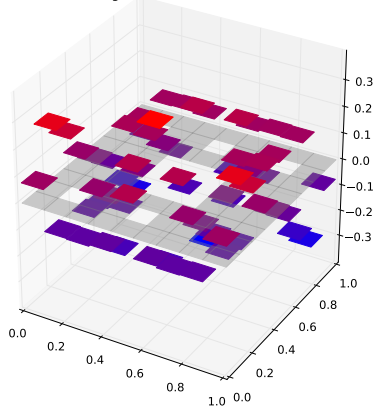


Klein Bottle Horizontal Glued Eigenfunction 29  
with eigenvalue 3.73118391612

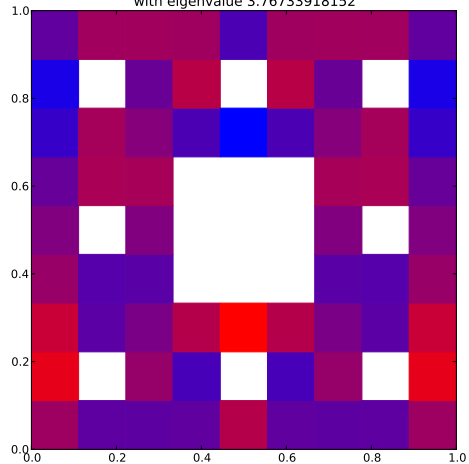


### Eigenfunction 30 with eigenvalue 3.76733918152

Klein Bottle Horizontal Glued Eigenfunction 30  
with eigenvalue 3.76733918152

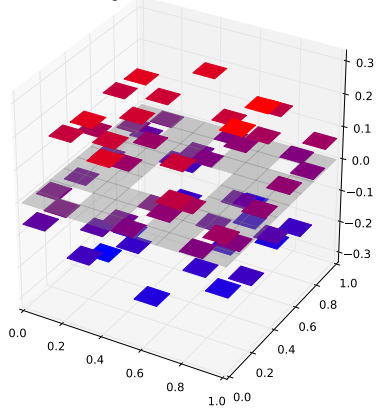


Klein Bottle Horizontal Glued Eigenfunction 30  
with eigenvalue 3.76733918152

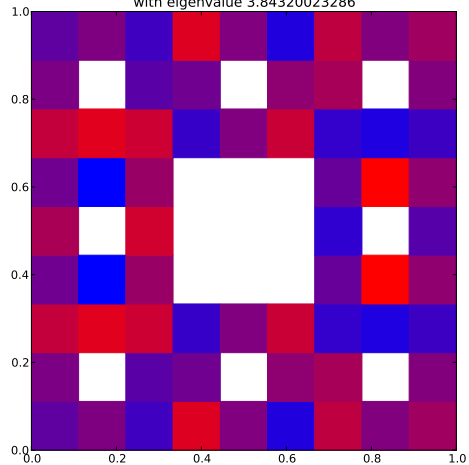


### Eigenfunction 31 with eigenvalue 3.84320023286

Klein Bottle Horizontal Glued Eigenfunction 31  
with eigenvalue 3.84320023286

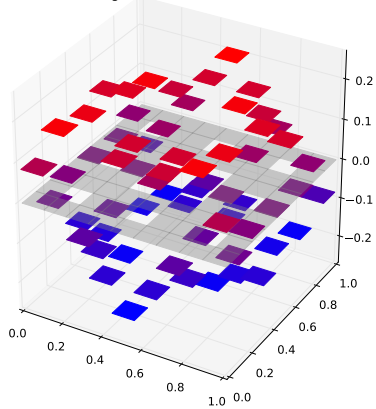


Klein Bottle Horizontal Glued Eigenfunction 31  
with eigenvalue 3.84320023286

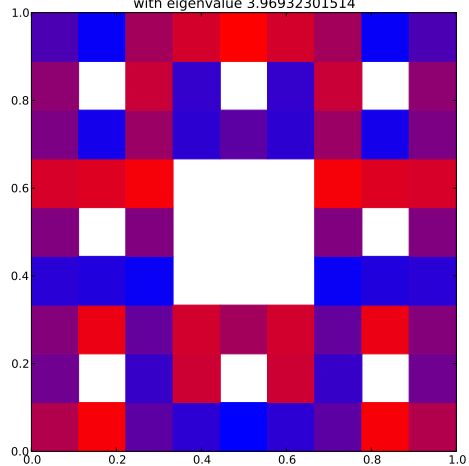


### Eigenfunction 32 with eigenvalue 3.96932301514

Klein Bottle Horizontal Glued Eigenfunction 32  
with eigenvalue 3.96932301514

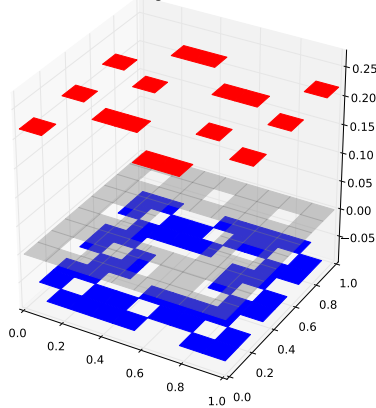


Klein Bottle Horizontal Glued Eigenfunction 32  
with eigenvalue 3.96932301514

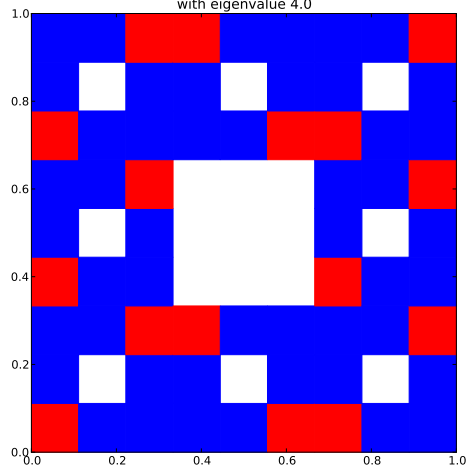


### Eigenfunction 33 with eigenvalue 4.0

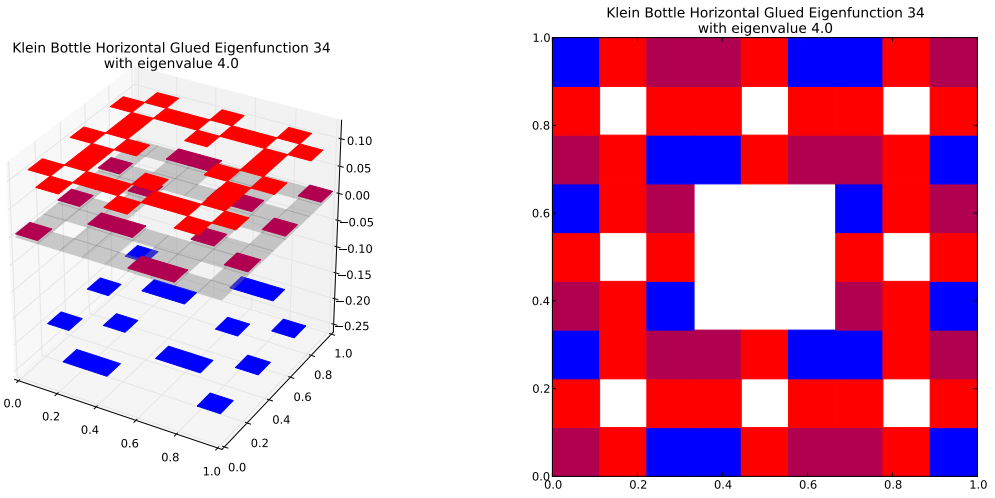
Klein Bottle Horizontal Glued Eigenfunction 33  
with eigenvalue 4.0



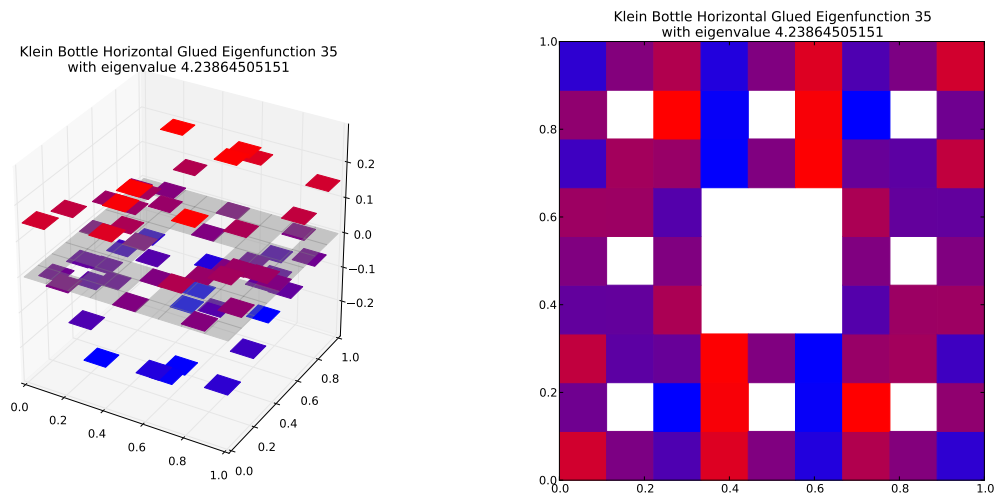
Klein Bottle Horizontal Glued Eigenfunction 33  
with eigenvalue 4.0



### Eigenfunction 34 with eigenvalue 4.0

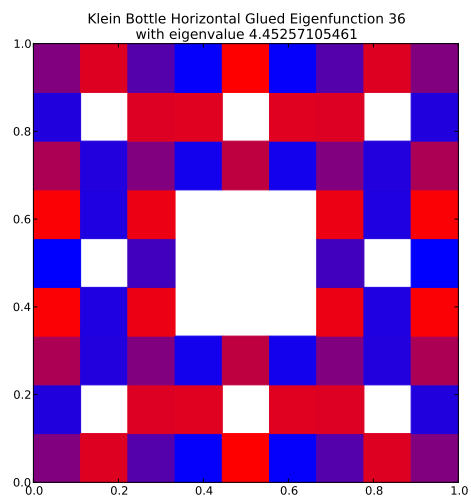
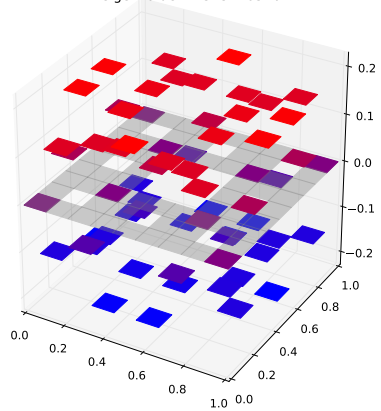


### Eigenfunction 35 with eigenvalue 4.23864505151



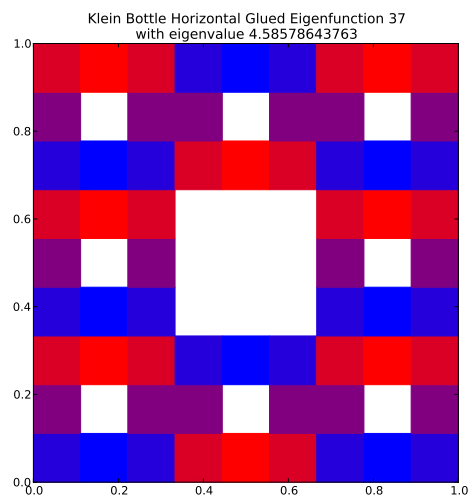
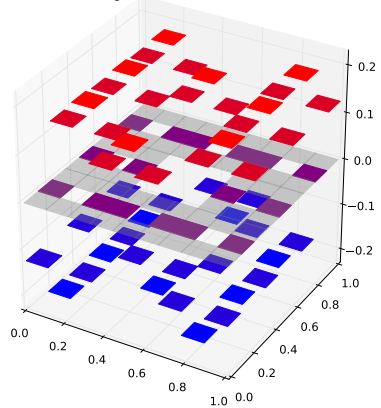
### Eigenfunction 36 with eigenvalue 4.45257105461

Klein Bottle Horizontal Glued Eigenfunction 36  
with eigenvalue 4.45257105461



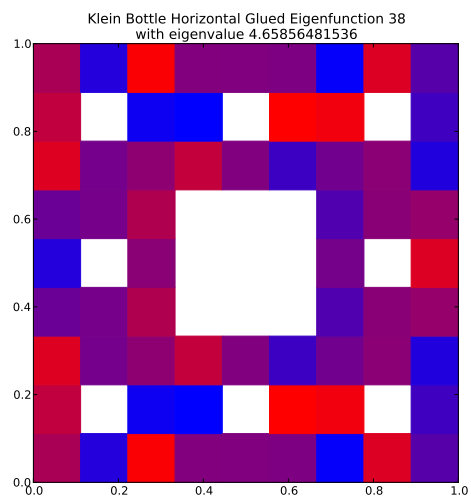
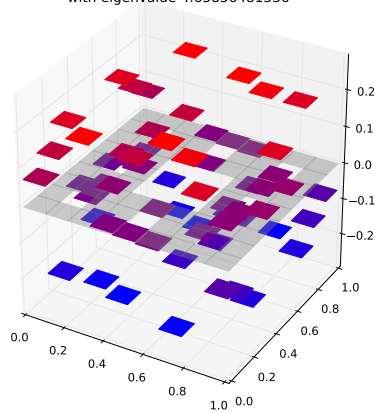
### Eigenfunction 37 with eigenvalue 4.58578643763

Klein Bottle Horizontal Glued Eigenfunction 37  
with eigenvalue 4.58578643763



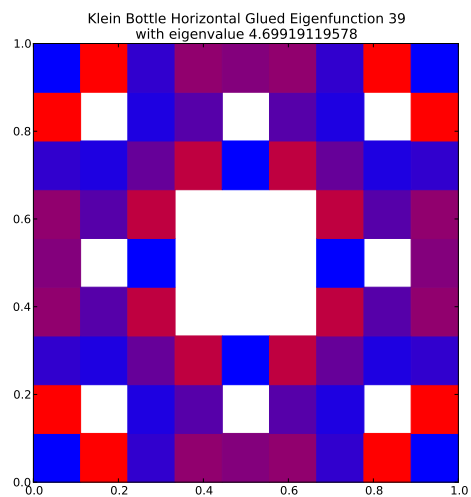
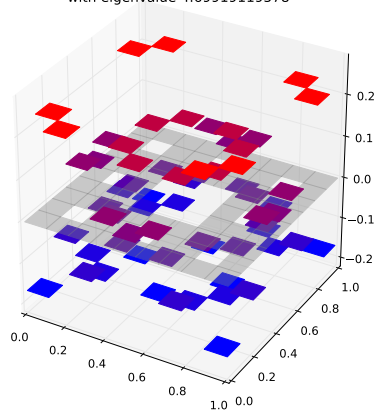
### Eigenfunction 38 with eigenvalue 4.65856481536

Klein Bottle Horizontal Glued Eigenfunction 38  
with eigenvalue 4.65856481536

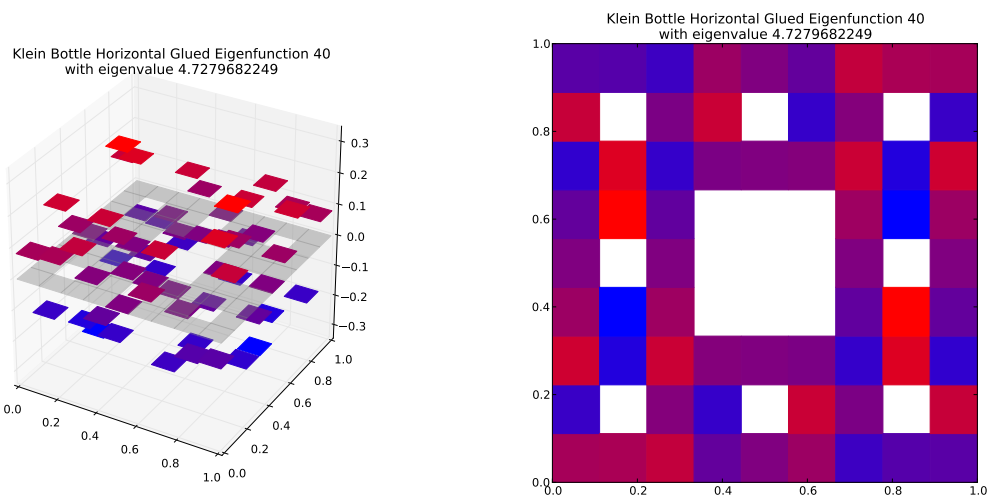


### Eigenfunction 39 with eigenvalue 4.69919119578

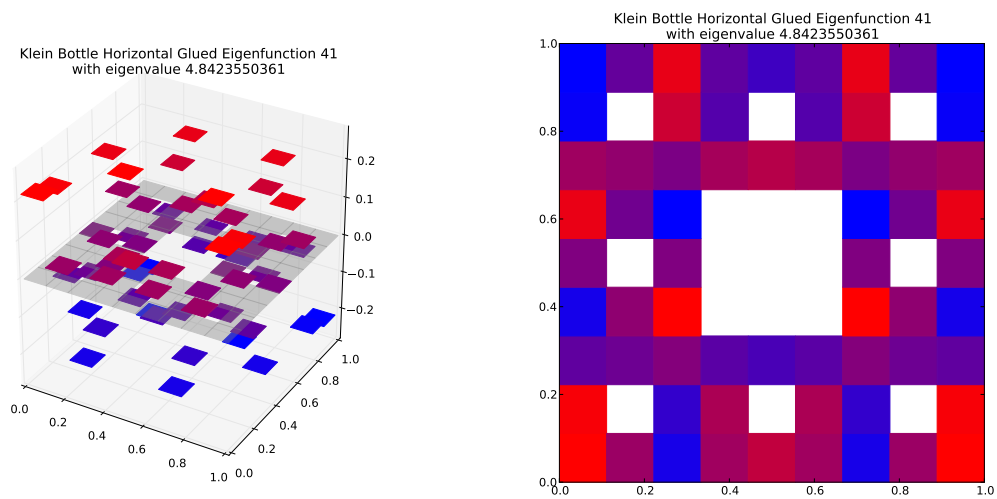
Klein Bottle Horizontal Glued Eigenfunction 39  
with eigenvalue 4.69919119578



### Eigenfunction 40 with eigenvalue 4.7279682249

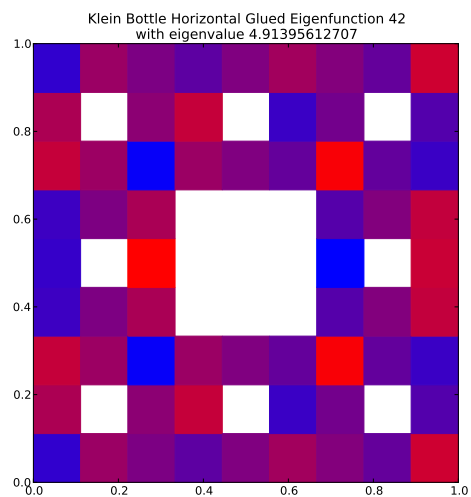
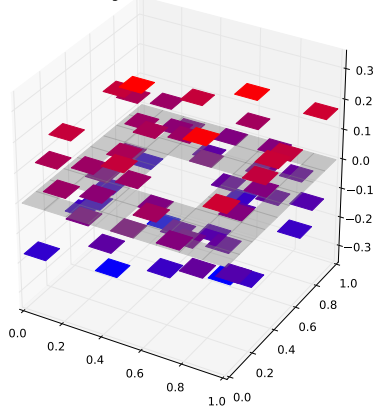


### Eigenfunction 41 with eigenvalue 4.8423550361



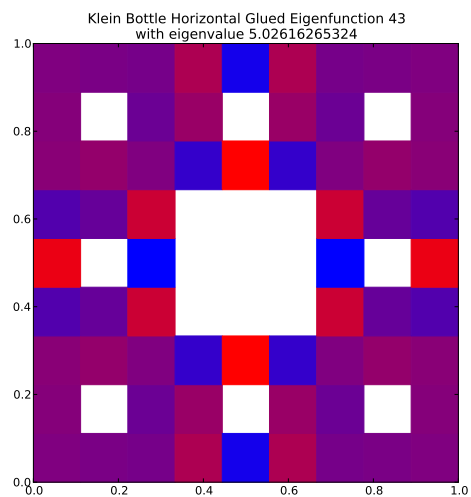
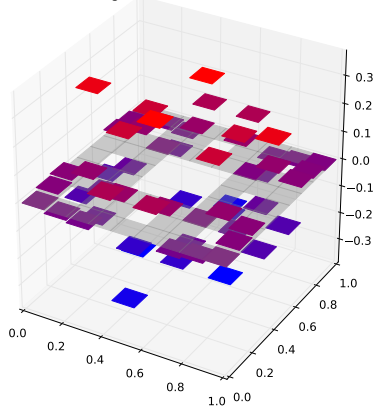
### Eigenfunction 42 with eigenvalue 4.91395612707

Klein Bottle Horizontal Glued Eigenfunction 42  
with eigenvalue 4.91395612707



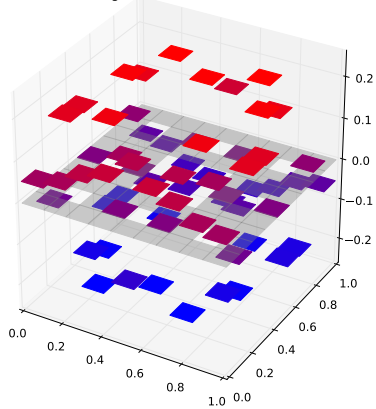
### Eigenfunction 43 with eigenvalue 5.02616265324

Klein Bottle Horizontal Glued Eigenfunction 43  
with eigenvalue 5.02616265324

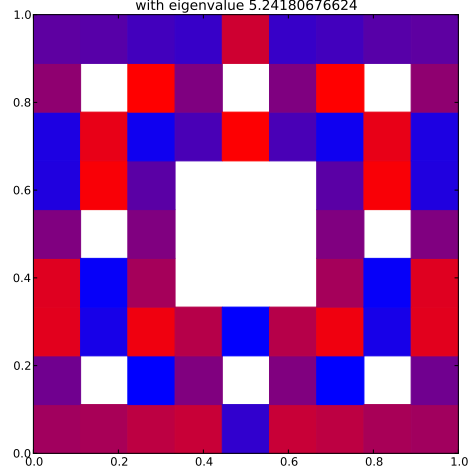


### Eigenfunction 44 with eigenvalue 5.24180676624

Klein Bottle Horizontal Glued Eigenfunction 44  
with eigenvalue 5.24180676624

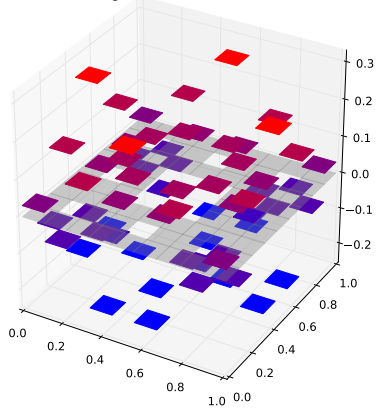


Klein Bottle Horizontal Glued Eigenfunction 44  
with eigenvalue 5.24180676624

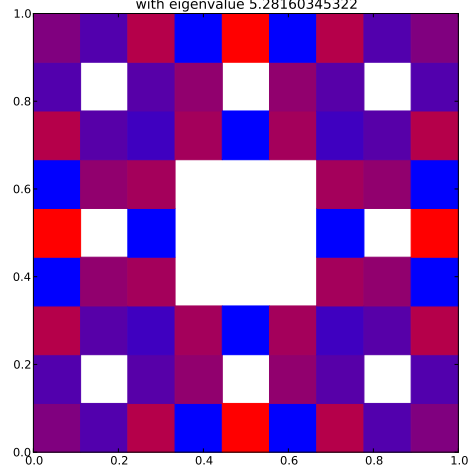


### Eigenfunction 45 with eigenvalue 5.28160345322

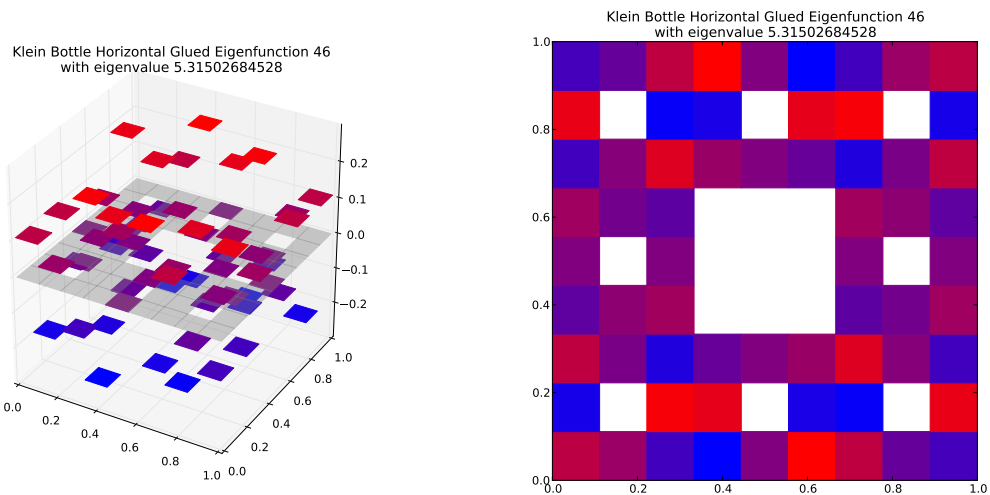
Klein Bottle Horizontal Glued Eigenfunction 45  
with eigenvalue 5.28160345322



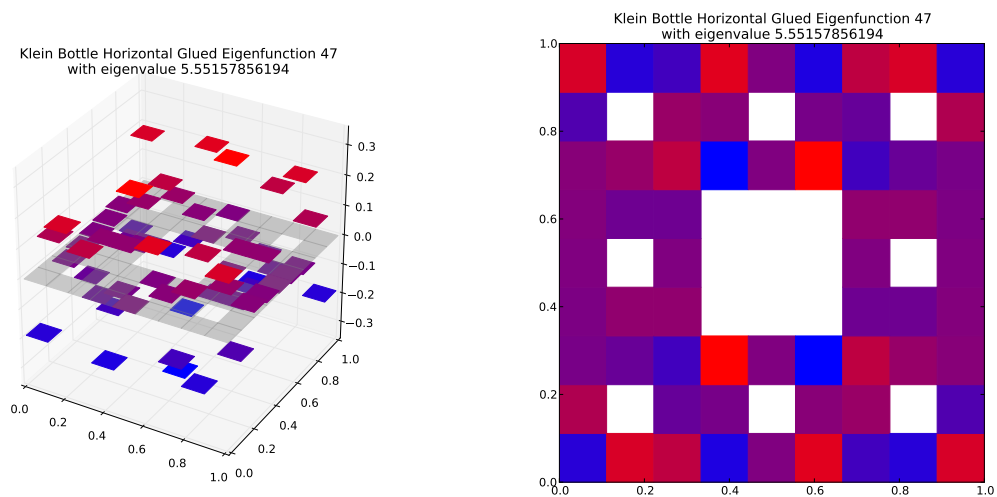
Klein Bottle Horizontal Glued Eigenfunction 45  
with eigenvalue 5.28160345322



### Eigenfunction 46 with eigenvalue 5.31502684528

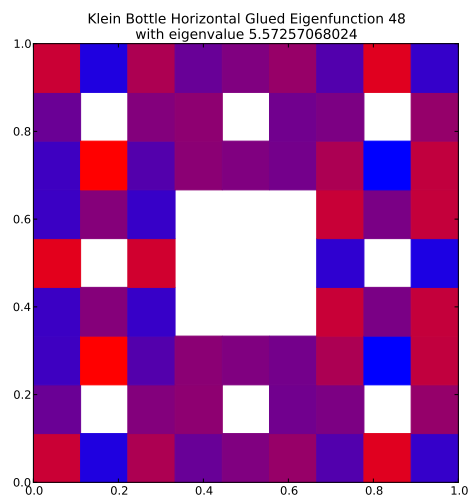
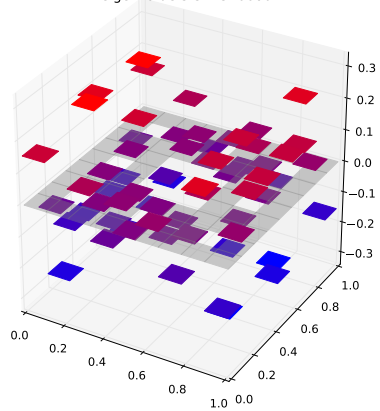


### Eigenfunction 47 with eigenvalue 5.55157856194



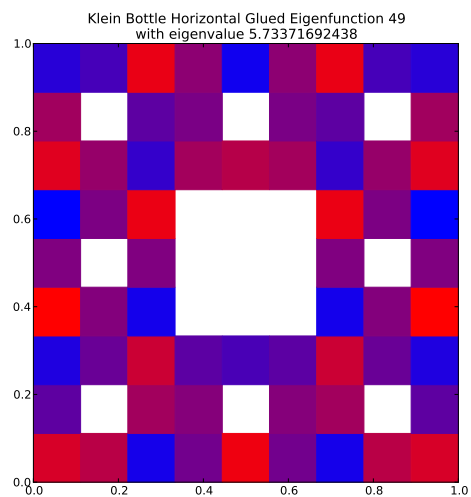
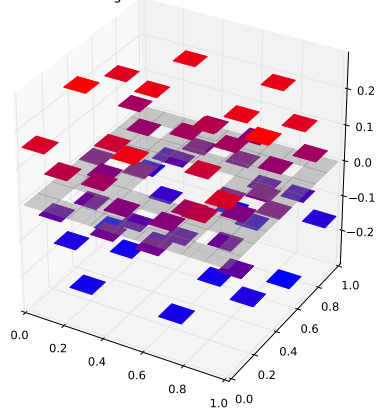
### Eigenfunction 48 with eigenvalue 5.57257068024

Klein Bottle Horizontal Glued Eigenfunction 48  
with eigenvalue 5.57257068024



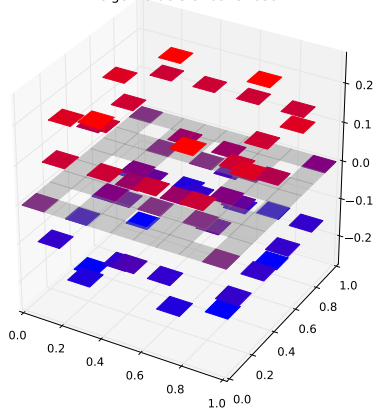
### Eigenfunction 49 with eigenvalue 5.73371692438

Klein Bottle Horizontal Glued Eigenfunction 49  
with eigenvalue 5.73371692438

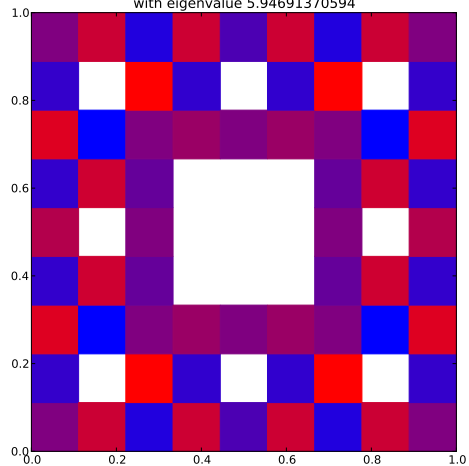


### Eigenfunction 50 with eigenvalue 5.94691370594

Klein Bottle Horizontal Glued Eigenfunction 50  
with eigenvalue 5.94691370594

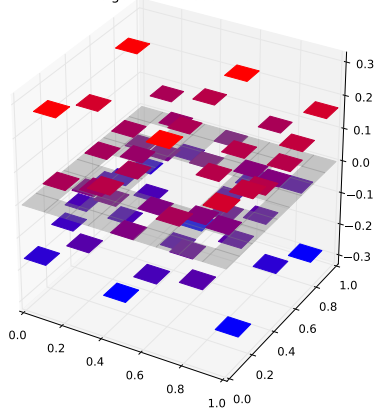


Klein Bottle Horizontal Glued Eigenfunction 50  
with eigenvalue 5.94691370594

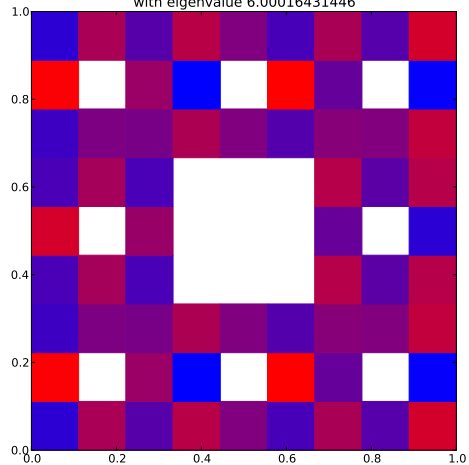


### Eigenfunction 51 with eigenvalue 6.00016431446

Klein Bottle Horizontal Glued Eigenfunction 51  
with eigenvalue 6.00016431446

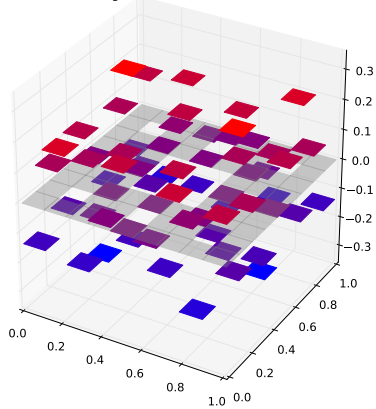


Klein Bottle Horizontal Glued Eigenfunction 51  
with eigenvalue 6.00016431446

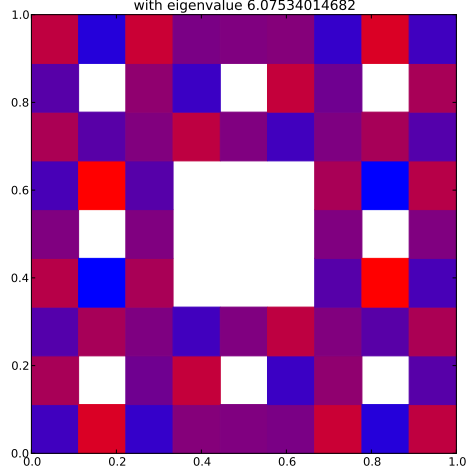


Eigenfunction 52 with eigenvalue 6.07534014682

Klein Bottle Horizontal Glued Eigenfunction 52  
with eigenvalue 6.07534014682

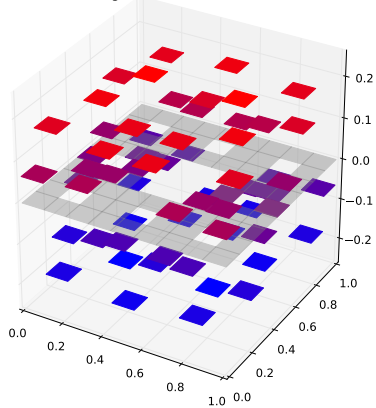


Klein Bottle Horizontal Glued Eigenfunction 52  
with eigenvalue 6.07534014682

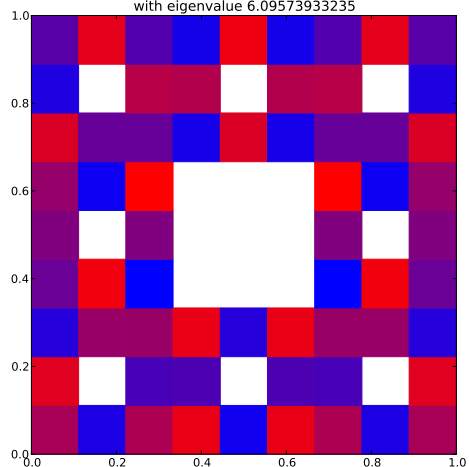


Eigenfunction 53 with eigenvalue 6.09573933235

Klein Bottle Horizontal Glued Eigenfunction 53  
with eigenvalue 6.09573933235

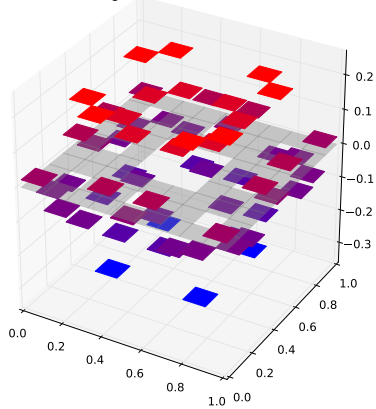


Klein Bottle Horizontal Glued Eigenfunction 53  
with eigenvalue 6.09573933235

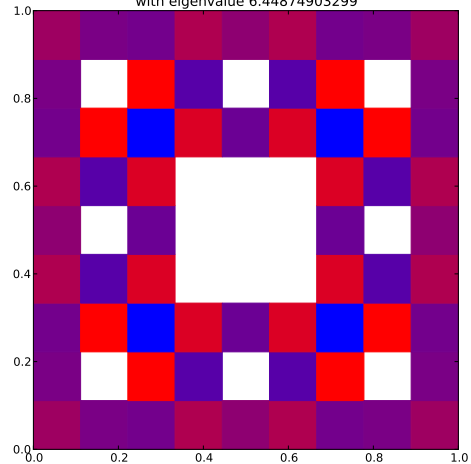


### Eigenfunction 54 with eigenvalue 6.44874903299

Klein Bottle Horizontal Glued Eigenfunction 54  
with eigenvalue 6.44874903299

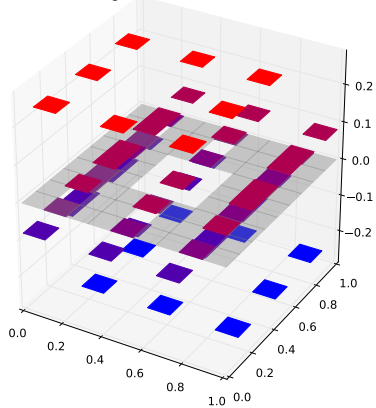


Klein Bottle Horizontal Glued Eigenfunction 54  
with eigenvalue 6.44874903299

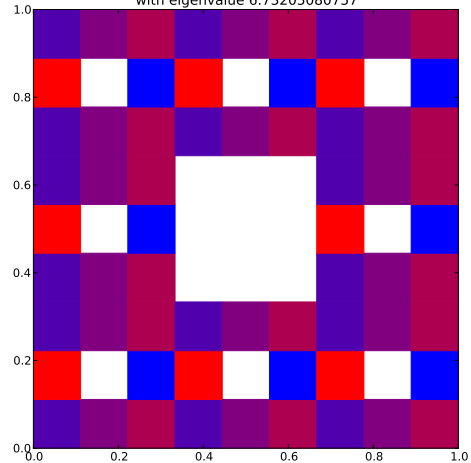


### Eigenfunction 55 with eigenvalue 6.73205080757

Klein Bottle Horizontal Glued Eigenfunction 55  
with eigenvalue 6.73205080757

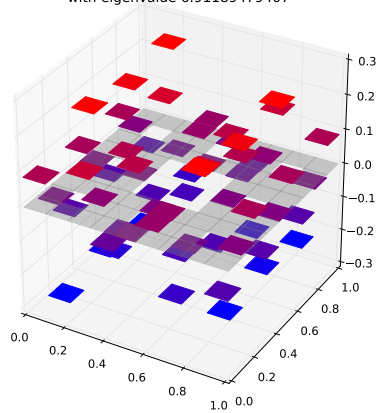


Klein Bottle Horizontal Glued Eigenfunction 55  
with eigenvalue 6.73205080757

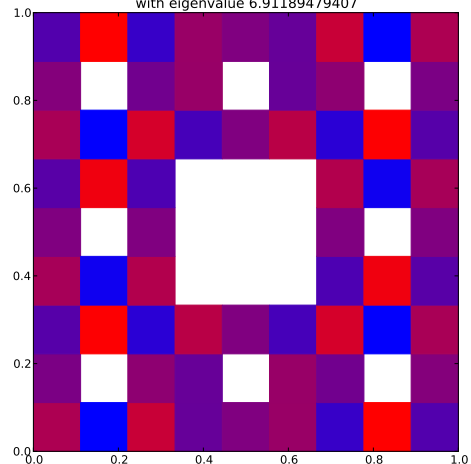


### Eigenfunction 56 with eigenvalue 6.91189479407

Klein Bottle Horizontal Glued Eigenfunction 56  
with eigenvalue 6.91189479407

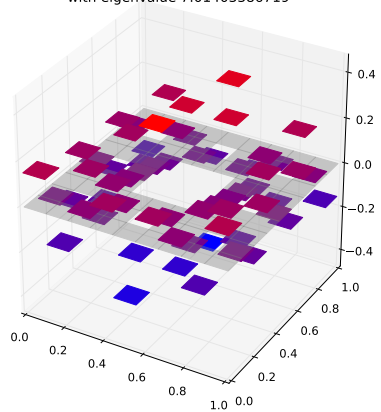


Klein Bottle Horizontal Glued Eigenfunction 56  
with eigenvalue 6.91189479407

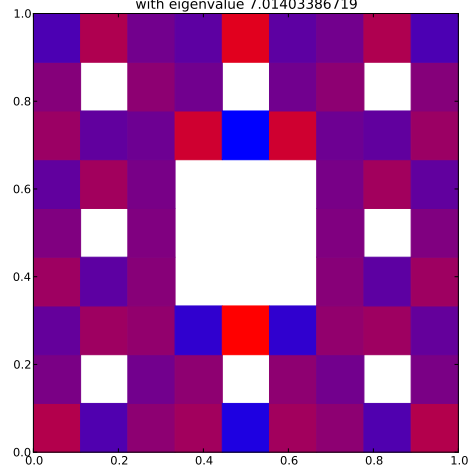


### Eigenfunction 57 with eigenvalue 7.01403386719

Klein Bottle Horizontal Glued Eigenfunction 57  
with eigenvalue 7.01403386719

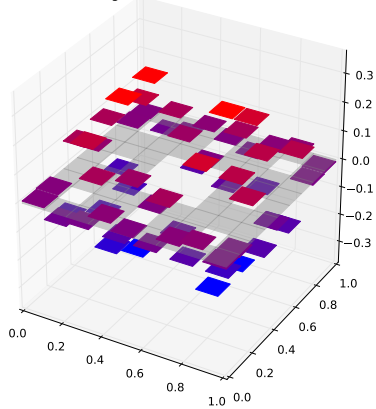


Klein Bottle Horizontal Glued Eigenfunction 57  
with eigenvalue 7.01403386719

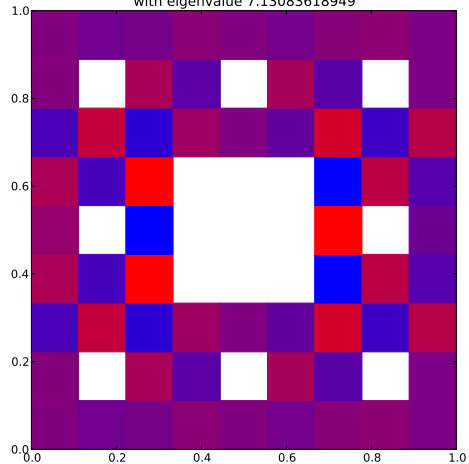


Eigenfunction 58 with eigenvalue 7.13083618949

Klein Bottle Horizontal Glued Eigenfunction 58  
with eigenvalue 7.13083618949

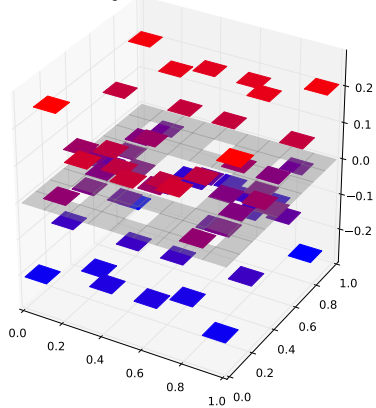


Klein Bottle Horizontal Glued Eigenfunction 58  
with eigenvalue 7.13083618949

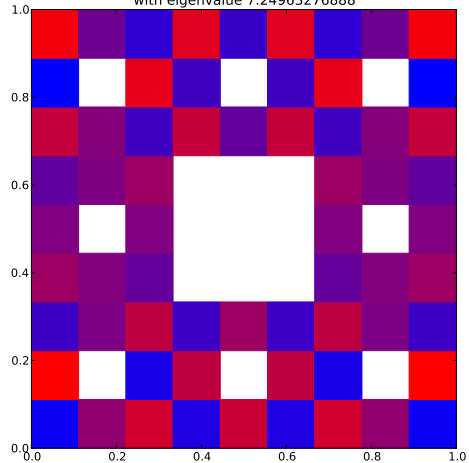


Eigenfunction 59 with eigenvalue 7.24963276888

Klein Bottle Horizontal Glued Eigenfunction 59  
with eigenvalue 7.24963276888

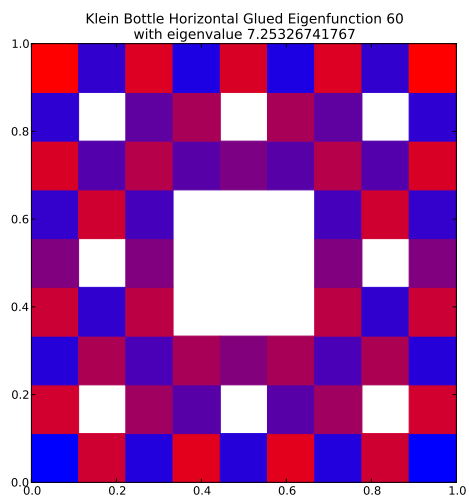
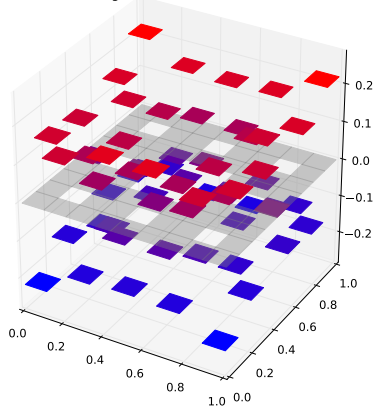


Klein Bottle Horizontal Glued Eigenfunction 59  
with eigenvalue 7.24963276888



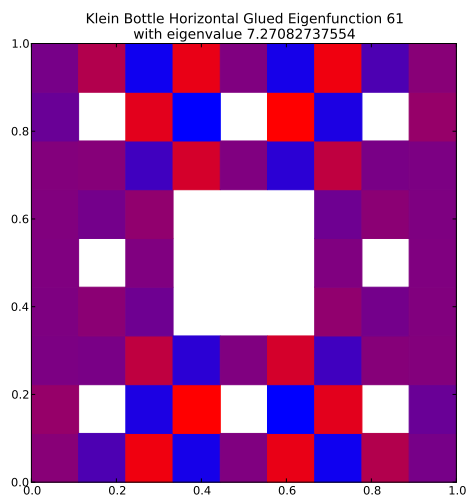
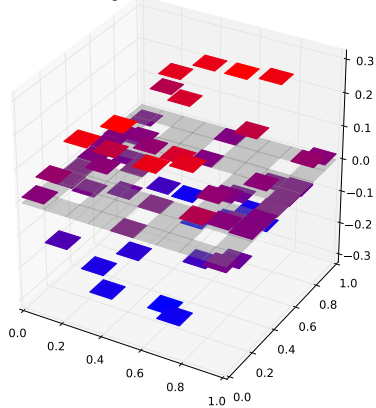
### Eigenfunction 60 with eigenvalue 7.25326741767

Klein Bottle Horizontal Glued Eigenfunction 60  
with eigenvalue 7.25326741767



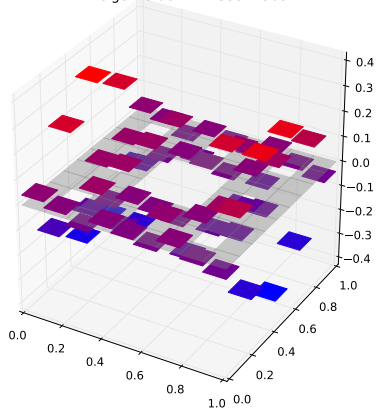
### Eigenfunction 61 with eigenvalue 7.27082737554

Klein Bottle Horizontal Glued Eigenfunction 61  
with eigenvalue 7.27082737554

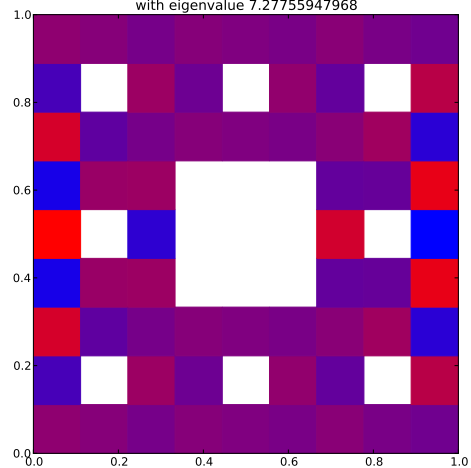


### Eigenfunction 62 with eigenvalue 7.27755947968

Klein Bottle Horizontal Glued Eigenfunction 62  
with eigenvalue 7.27755947968

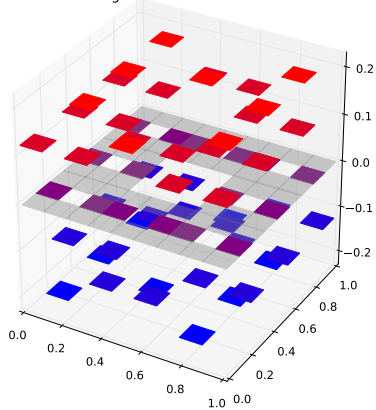


Klein Bottle Horizontal Glued Eigenfunction 62  
with eigenvalue 7.27755947968



### Eigenfunction 63 with eigenvalue 7.41421356237

Klein Bottle Horizontal Glued Eigenfunction 63  
with eigenvalue 7.41421356237



Klein Bottle Horizontal Glued Eigenfunction 63  
with eigenvalue 7.41421356237

