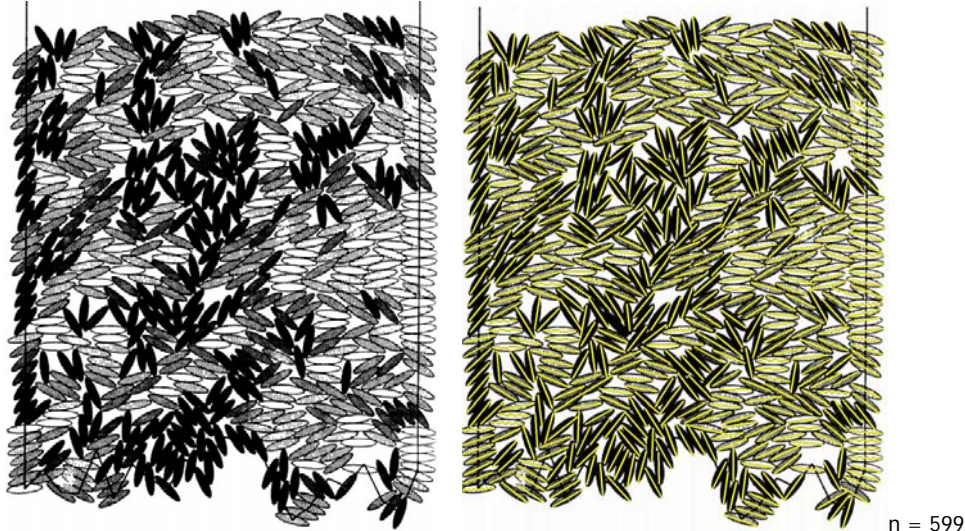


Orientation patterns as rose diagram

Original data and digitised axes



Script code for evaluating orientation angles

```
# Import raw data
file = "vectors.txt"
data = read.table(file, header=FALSE)
data2 = data
phi = data[,1]
count = 1

# Test and correct coordinates for directions
while (count <= length(data))
{
  if (data[count, 5] > data[count, 3])
  {
    data2[count,2] = data[count,4]
    data2[count,4] = data[count,2]
    data2[count,3] = data[count,5]
    data2[count,5] = data[count,3]
  }
  count = count + 1
}

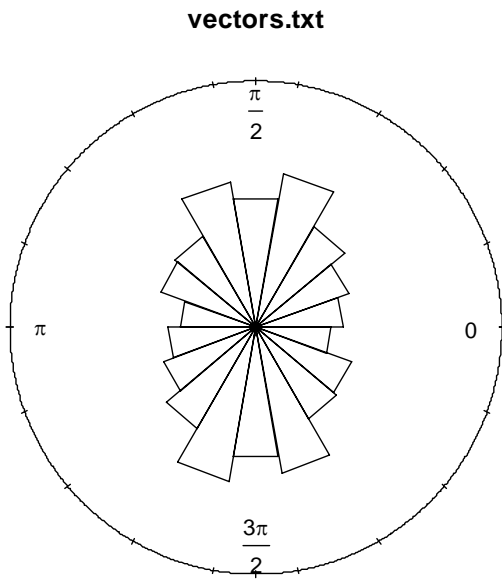
# Calculate lengths of vector projections
lengthx = data2[,4] - data2[,2]
lengthy = data2[,5] - data2[,3]

# Calculate a axis angle by atan
phia = 90 - (atan(lengthy / lengthx)) / (pi / 180)
phib = 270 + (atan(lengthy / sqrt(lengthx^2))) / (pi / 180)
phi = ifelse (lengthx > data[,1], phia, phib)

# angle of a axis in quadrants I and IV
phiinterim = ifelse (phi < 0, phinorth + 360, ifelse (phi > 360, phi - 360, phi))
phinew = ifelse (phiinterim < 90, phiinterim, ifelse (phiinterim < 180, phiinterim + 180, ifelse (phiinterim < 270, phiinterim - 180, phiinterim)))

# Visualisation in rose diagram
library(circular)
x = circular(rad(phinew))
x2 = c(x, (x+pi))
rose.diag(x2, prop = 2, bins = 18, main = file)
```

Rose diagram of orientation angles



- Bin size 18 degrees
- Angles are given as radians
- Plot starts at three o'clock with zero, i.e. vertically oriented objects yield radians of zero; horizontally oriented objects yield radians of 1/2 and 3/2 Pi.
- Discussion: there appears to be a weak monodirectional orientation pattern or a very weakly developed bimodal distribution.

Generated orientation data in degree (0-90 and 270-360 degree)

327.4582104	87.4442016	306.2239974	349.261113	329.2864758	300.7128065	41.98668662	295.3958313	302.7357378	77.30797279	8.663007097
7.4715069	287.8199564	283.239634	351.8698986	2.468725783	298.9029265	80.45991827	85.91417841	299.6868929	276.1314772	301.1591685
19.33490623	289.3352227	270	29.8088947	327.6792013	43.95826126	72.89777024	296.1045235	304.8241056	282.3247463	292.7639777
353.7130582	81.67443818	76.58402239	72.05848888	311.186347	317.4588432	74.61065639	298.6521105	308.5842974	290.4966448	288.1462021
357.1135118	81.67467385	75.33533478	58.45654349	43.92001949	312.9298596	65.0099367	72.37213417	314.626622	78.5971878	283.1503139
40.45156169	37.95381098	271.5623364	66.99742224	37.56799223	315.0000314	61.98106348	295.8792474	325.3043363	77.21619687	273.06472946
40.96260365	30.88524975	304.5621709	58.59525235	31.90054245	287.6282658	353.88416	287.0305359	292.8579288	288.258441	17.32416955
49.7635932	30.88129351	74.93112592	81.71368772	279.5444277	300.96426	327.4494127	55.79841324	295.4415558	301.8548838	37.96293041
53.79731941	72.19757831	72.55187932	293.1983966	275.5608025	37.92103996	44.66523515	84.39079831	44.29316404	317.6026532	86.57634449
61.95551999	77.73534893	289.7465569	278.8963702	285.6793954	52.3648016	6.679730436	62.37358829	288.9541096	330.1408909	282.5840232
65.01342313	77.63116655	75.13092386	67.19014564	330.9452957	22.37991238	29.05555062	61.34873058	281.2102754	295.8937522	297.2545347
66.80129001	71.25883396	61.83696455	69.44413487	329.2072876	19.05757852	39.21778605	71.41351827	31.45218302	297.2545347	297.2545347
276.8816909	54.7583454	8.555747919	72.18145183	334.9817978	295.2916961	19.94275378	72.58192768	339.1034533	276.6214586	276.6214586
270	55.49111987	43.89214069	72.3714763	68.10110615	302.8288873	28.85623009	48.86540882	84.28953908	298.523162	298.523162
277.3525197	50.3771345	309.8672103	68.10151426	65.55617142	85.32237752	358.0911792	77.97761712	282.3070747	86.57634449	86.57634449
282.9572306	13.68317072	325.8143082	64.58068948	60.58360742	270	15.94536139	84.89799153	293.0708507	77.47135685	77.47135685
68.9279727	12.06110057	320.0642753	69.5020263	59.12312059	284.5166524	78.48606862	60.31237694	300.8774861	81.55245718	81.55245718
66.55764055	20.06252797	327.9419571	85.31425635	359.5022208	33.82717954	64.14750245	276.3400572	291.9833542	82.63194099	82.63194099
58.04245962	53.65279289	292.9326862	42.97817593	13.11724497	39.17437967	63.01189398	278.3508283	288.7415666	76.09632121	76.09632121
37.71115362	25.04612402	298.9597595	64.88530035	7.764247449	39.25510941	86.08903808	70.78067305	287.1402755	65.47313914	65.47313914
31.30997763	324.2943786	353.9276733	340.9420965	26.32348974	328.949924	49.1116803	79.83803836	291.8979621	291.8014176	291.8014176
56.04818923	19.74741709	326.9375935	47.35306678	7.124479702	345.6783252	273.6524651	292.0938953	300.5405528	291.7086711	291.7086711
64.14862198	45.32116755	40.91484565	62.65019312	288.4349749	31.39425233	334.3236486	296.3377782	313.221865	275.8154083	275.8154083
305.9229127	9.612395876	87.32393575	308.66038	286.7984206	59.74418899	348.6903413	299.6238116	322.038217	77.86664073	77.86664073
293.7132419	14.03693601	329.2752217	301.8418557	292.579172	48.62139222	1.494434519	306.2803136	72.23519624	83.918407	83.918407
294.4042444	25.65917093	270.9954833	301.6395798	275.1300097	52.49554899	335.1909012	343.917823	60.48868726	10.16211328	10.16211328
334.4763654	55.91104508	10.58680959	299.7452009	316.7782063	61.55741576	346.2003164	318.9086754	57.65228355	57.38043782	57.38043782
334.5160442	69.49784649	30.25617002	286.654279	322.4317423	70.4637797	325.2118187	278.0591753	62.75839241	62.77144219	62.77144219
306.1290605	60.50569838	271.4189881	271.1489881	15.03025086	278.8962874	53.12980014	271.4815123	82.54556079	319.1120349	319.1120349
45.32791838	50.93212094	281.8337649	356.4239291	65.87077653	55.82635735	278.1297287	275.1021534	308.8966954	65.19066712	65.19066712
17.83593647	48.66753348	88.0738237	51.55673555	79.07713526	83.28981864	299.4753818	63.88579969	10.52720277	60.83263443	60.83263443
23.57375573	30.87699727	282.2420963	2.603143454	80.7761126	88.89926418	32.31889399	78.11056799	9.79965175	299.9309288	299.9309288
30.4184452	60.90009233	88.492459	7.556137196	73.58184129	82.48152323	39.92758974	82.56926058	1.9415623	302.5852758	302.5852758
8.481092222	52.30610711	280.5864485	36.45598366	283.1206097	278.2863123	51.17961894	64.09398367	82.56871525	288.2730121	288.2730121
63.43481698	33.24723546	280.9042236	60.69755076	62.4875312	275.9799218	353.1173881	297.2043822	277.6281985	295.441537	295.441537
54.4055223	42.06394868	286.7002882	57.94306877	61.3473907	59.21570161	334.0935069	275.2902105	279.3814529	306.0649274	306.0649274
67.91889777	39.14389897	293.0026174	60.19514422	72.04387889	285.3879704	308.5854515	295.866244	89.02960556	323.0279945	323.0279945
331.955239	37.65857773	348.0488225	67.64678835	275.868986	33.8260285	314.2545082	301.3284516	68.3948827	273.1230737	273.1230737
348.8959617	32.51236095	337.2637667	70.27753696	281.9445073	42.47934862	312.0648012	299.6786976	74.4756957	300.2559399	300.2559399
11.40199014	47.42897707	352.8749774	60.58428989	271.0614747	329.3810889	345.1594691	303.1302878	70.959609	307.5039874	307.5039874
25.25386047	61.4298221	327.3490987	37.87521699	291.5163649	326.72475	347.5821372	308.8109669	75.50012742	293.3846203	293.3846203
65.59639771	67.45654259	355.3225561	36.86873703	80.69036961	5.012906086	74.05438364	281.9907997	72.41934805	287.2920437	287.2920437
286.4172374	66.93019761	302.4705498	25.14404846	298.9016799	325.9111079	81.29173396	282.4174298	282.67994338	282.67994338	282.67994338
281.8106683	60.85212164	299.0543969	46.50819931	60.38453489	42.41435131	76.0924757	341.7375046	59.66829389	271.5761846	271.5761846
75.84583779	310.1201183	298.7263287	14.9663032	315.9926081	338.1105272	294.6421511	323.9389663	82.34320446	309.0118677	309.0118677
51.89917937	304.6080551	77.58323595	355.1917253	322.7336654	3.180031188	283.4776818	322.5492553	70.73551648	313.5678249	313.5678249
74.12454174	294.0112753	61.18940146	317.7585896	297.2293467	68.48359569	50.63964143	293.8504216	63.9140753	326.0232693	326.0232693
282.4750818	85.27957348	47.07004579	27.12001211	279.3022133	75.83725687	284.4200787	302.6370263	84.23763101	277.6066221	277.6066221
61.06828754	69.4426843	43.9321583	27.95038946	271.0131084	34.73781642	294.9865385	316.4686777	214.1224441	314.626622	314.626622
44.66469391	287.030545	40.43957806	24.56707771	272.1207339	73.21743671	335.1111174	329.9317832	284.9612332	295.0825703	295.0825703
40.17936257	78.39549777	41.71904334	11.86469869	284.2761294	64.3224303	335.4329309	340.5292421	289.7808105	86.6864073	86.6864073
27.18102498	71.7276457	38.8968041	15.25610237	16.44938099	51.17962006	289.2197839	296.5656188	87.59363026	275.6593367	275.6593367
11.96236232	56.44383047	46.09371177	321.6322573	58.09945368	59.03579832	307.476286	298.8866809	81.46952016	272.5117968	272.5117968
25.2778809	45.66655187	87.51120744	312.878805	63.89537817	76.09244885	299.3581588	308.8300883	277.986435	271.5205026	271.5205026
28.20763693	296.5656761	273.0396108	320.132757	28.49437799	84.38992608	288.9107986	321.3400933	280.2218554	64.6036075	64.6036075
290.4975241	277.0619478	272.5797643	331.1880261	305.5988173	30.04700796	345.0049848	320.1942612	291.7092981	51.64869188	51.64869188
298.8560895	276.6797319	78.11065498	358.9592931	328.7675985	72.37131461	353.8164795	328.8518987	275.9062555	275.9064027	275.9064027
294.4450863	67.26323859	294.114493	330.8024195	309.3219896	60.54182821	300.0185267	287.168041	287.1758638	65.76928479	65.76928479
64.27396757	292.0947615	294.8414975	339.4441266	292.880236	278.0591712	294.161307	298.570957	81.59186787	331.1900505	331.1900505