

Report Project 2

Phase 3
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Instructions to run the code:

- 1) The folder contains the code file named as game_p3.cpp.
- 2) The code defines three values namely MAX_DEPTH, ALPHA and BETA in the beginning . Change their values as desired and compile the code using g++.
- 3) Now run the executable and play the game.
- 4) For each move of the computer, the code calculates the number of nodes generated, number of nodes explored and number of nodes pruned.

Alpha-beta Pruning

Evaluation Function = $\text{ALPHA} * \text{Disk_count} + (1 - \text{ALPHA}) * \text{Weighted_Disk_Count}$
Depth = 1

ALPHA value	Total Number of Nodes Generated	Total Number of Nodes Explored	Total Number of Nodes Pruned	Human Score	Computer Score
0	254	29	0	55	9
0.25	215	34	0	54	9
0.50	262	30	0	63	1
0.75	202	29	0	43	21
1	268	30	0	44	20

Depth = 2

ALPHA value	Total Number of Nodes Generated	Total Number of Nodes Explored	Total Number of Nodes pruned	Human Score	Computer Score
0	1204	207	226	13	51
0.25	1862	246	571	48	16

0.50	871	161	200	35	29
0.75	871	161	223	35	29
1	859	163	224	28	36

Depth = 3

ALPHA value	Total Number of Nodes Generated	Total Number of Nodes Explored	Total Number of Nodes pruned	Human Score	Computer Score
0	17574	1221	9604	28	36
0.25	21649	1455	13806	41	23
0.50	15984	1352	9168	51	13
0.75	4224	464	2235	33	1
1	13688	1088	7511	36	28

Depth = 4

ALPHA value	Total Number of Nodes Generated	Total Number of Nodes Explored	Total Number of Nodes pruned	Human Score	Computer Score
0	102871	7014	61541	21	43
0.25	83663	3880	60300	48	15
0.50	133154	5683	104979	34	30
0.75	156589	6428	126933	7	57
1	136168	6143	111164	19	45

Depth = 5

ALPHA value	Total Number of Nodes Generated	Total Number of Nodes Explored	Total Number of Nodes pruned	Human Score	Computer Score
0	1132274	34073	938868	22	42
0.25	11431165	29245	990131	26	38
0.50	1590887	42090	1327227	23	41
0.75	1106769	24919	973335	49	15
1	1023228	25560	882044	9	55

Depth = 6

ALPHA value	Total Number of Nodes Generated	Total Number of Nodes Explored	Total Number of Nodes pruned	Human Score	Computer Score
0	7755445	160297	6849162`	1	57
0.25	21467834	365436	19461200	14	50
0.50	22594428	310794	20934003	27	37
0.75	12438983	180376	11581242	20	44
1	7135078	97012	6714132	15	48

Evaluation function = ALPHA*(Weighted_Disk_count)+ BETA*(Number_of_valid_moves)+(1-ALPHA-BETA)*Disk_count

Depth =1

ALPHA	BETA	Total Number of Nodes Generated	Total Number of Nodes Explored	Total Number of Nodes pruned	Human Score	Computer Score
0	0	254	29	0	55	9
0	0.25	266	31	0	42	22
0	0.50	272	29	0	44	20
0	0.75	357	31	0	21	43
0	1	269	29	0	40	24
0.25	0	215	29	0	54	9
0.25	0.25	265	29	0	53	11
0.25	0.50	289	30	0	42	22
0.25	0.75	282	28	0	62	0
0.50	0.0	215	29	0	54	9
0.50	0.25	222	28	0	54	8
0.50	0.50	314	30	0	36	28
0.75	0.0	215	29	0	54	9
0.75	0.25	239	28	0	40	24
1	0	268	30	0	44	20

Depth =2

ALPHA	BETA	Total Number of Nodes Generated	Total Number of Nodes Explored	Total Number of Nodes pruned	Human Score	Computer Score
0	0	1204	207	226	13	51
0	0.25	1775	274	470	51	13
0	0.50	2113	290	895	15	49
0	0.75	1864	270	791	51	13
0	1	1752	321	827	7	55
0.25	0	1862	246	571	48	16
0.25	0.25	1412	173	373	59	5
0.25	0.50	2626	351	1227	17	47
0.25	0.75	1578	241	616	50	14
0.50	0.0	871	161	200	35	29
0.50	0.25	1542	207	489	33	31
0.50	0.50	1861	247	669	39	25
0.75	0.0	1916	248	670	40	24
0.75	0.25	1096	149	255	58	6
1	0	859	163	224	28	36

Depth =3

ALPHA	BETA	Total Number of Nodes Generated	Total Number of Nodes Explored	Total Number of Nodes pruned	Human Score	Computer Score
0	0	17574	1221	9604	28	36
0	0.25	20869	1665	11038	57	7
0	0.50	20276	1126	12828	34	30
0	0.75	15752	1097	8394	53	11
0	1	18317	989	11777	39	25
0.25	0	21649	1455	13806	41	23
0.25	0.25	11803	1087	6493	46	18
0.25	0.50	27783	1476	17979	35	29
0.25	0.75	14743	1091	7818	54	10
0.50	0.0	15984	1352	9168	51	13
0.50	0.25	22569	1433	13796	43	21

0.50	0.50	19604	1145	12785	30	34
0.75	0.0	4224	464	2235	33	1
0.75	0.25	14177	1229	6937	35	29
1	0	13688	1088	7511	36	28

Depth =4

ALPHA	BETA	Total Number of Nodes Generated	Total Number of Nodes Explored	Total Number of Nodes pruned	Human Score	Computer Score
0	0	102871	7014	61541	21	43
0	0.25	239143	10258	183825	42	22
0	0.50	142697	8056	101487	52	12
0	0.75	133165	7326	111125	0	59
0	1	100288	7646	76799	4	60
0.25	0	111207	5342	83787	19	45
0.25	0.25	160236	9779	116134	5	58
0.25	0.50	131673	5923	106211	39	25
0.25	0.75	88883	5029	68583	32	32
0.50	0.0	114340	4708	90319	35	29
0.50	0.25	135254	7870	102692	0	53
0.50	0.50	152778	8294	116014	17	47
0.75	0.0	136200	6512	108263	22	42
0.75	0.25	219733	11639	163513	15	49
1	0	122882	5893	98896	28	36

Depth =5

ALPHA	BETA	Total Number of Nodes Generated	Total Number of Nodes Explored	Total Number of Nodes pruned	Human Score	Computer Score
0	0	1030404	32269	844522	26	38
0	0.25	1530819	40448	1303742	23	41
0	0.50	2043060	47305	1770773	43	21
0	0.75	1334974	21481	1164839	2	61
0	1	772421	14464	698998	48	16
0.25	0	1175457	25536	1028706	63	1

0.25	0.25	1444559	24891	1322009	55	8
0.25	0.50	1363505	39833	1127622	43	21
0.25	0.75	2356286	29138	2107602	1	63
0.50	0.0	1590887	42090	1327227	23	41
0.50	0.25	961306	25972	802289	35	29
0.50	0.50	1680316	48641	1375270	19	45
0.75	0.0	1236106	28193	1062827	0	64
0.75	0.25	782691	22389	635470	5	58
1	0	1023228	25560	882044	9	55

Depth =6

ALPHA	BETA	Total Number of Nodes Generated	Total Number of Nodes Explored	Total Number of Nodes pruned	Human Score	Computer Score
0	0	7755445	160297	6849162	1	57
0	0.25	9636825	213743	8359406	56	8
0	0.50	8963909	141831	8442729	4	60
0	0.75	8267697	133276	7856886	5	59
0	1	5139259	84982	4918357	10	54
0.25	0	21467834	365436	19461200	14	50
0.25	0.25	8925446	198027	7792424	16	48
0.25	0.50	9603188	271016	8269611	4	60
0.25	0.75	5677567	88302	5432458	0	64
0.50	0.0	22594428	310794	20934003	27	37
0.50	0.25	151215700	167915	14200559	22	42
0.50	0.50	7604808	121271	7148209	7	57
0.75	0.0	23518957	294385	21850078	31	33
0.75	0.25	11814747	123662	11242017	0	61
1	0	7135078	97012	6714132	15	48