${}^0O_{S7ZY\ Zref} = (257, 178, 262)[\deg]$

The hand tip target positio ${}^0P_{S7ref}$,modification weight W_p , W_o , allowable error e_p , e_o ,initial joint angle $\theta_1[1], \ldots\ldots, \theta_6[1]$, target posture ${}^0O_{S7ZY\ Zref}$ are set as follows:

The allowable error of the position is 0.12% as compared with the whole arm length $0.835[m]$. The initial joint angle is set to such a value avoiding peculiar posture in accordance with the Newton–Raphson method because a peculiar posture is taken when all angles are $0[rad]$ and because calculation of Jacobian determinant by Newton–Raphson method is not possible, as explained later.

Using the conditions described above, the solution of inverse kinematics is obtained using the Method of Sequential Retrieval. Consequently, solutions of eight types are obtained as shown in Table 2

TABLE2 ANGLE VALUES $([rad])$ OF OBTAINED SOLUTIONS

NO.	θ_1	θ_2	θ_3	θ_4	θ_5	θ_6
1	2.7335	5.1566	4.9733	1.1615	2.9943	4.2970
2	2.7883	4.1525	1.3347	1.7191	2.7877	2.5952
3	5.9293	2.1287	4.9450	4.8632	2.7881	2.5894
4	5.8757	1.1270	1.3064	4.3039	2.9934	4.2941
5	2.6429	5.8709	4.3503	4.2479	0.2419	1.0979
6	2.5690	3.4925	1.9039	4.9814	0.5326	5.7971
7	5.7109	2.7906	4.3789	1.8398	0.5322	5.7968
8	5.7835	0.4098	4.9328	1.1061	0.2437	1.0959

TABLE 3 TARGET VALUES AND RESULTS.

NO	${}^0p_{S7ref}[m]$			${}^0O_{S7ZY\ Zref}[\deg]$			W_p			
	x	y	z	Z	Y	Z	1	0.7	0.4	Rand
1	0.11	0.10	0.31	180	288	67	×	○	○	○
2	-0.09	0.40	0.10	330	67	197	×	×	○	○
3	-0.02	0.03	0.32	332	287	47	○	×	×	○
4	-0.07	-0.06	0.30	47	258	74	×	×	×	×

Ⅳ CONCLUSIONS

To obtain solutions of inverse kinematics of an RPY-type robot arm, the Method of Sequential Retrieval is proposed in this paper. The following results were obtained.

1) It was confirmed that a maximum of eight solutions are obtained using the Method of Sequential Retrieval.

2) Such an example demonstrates that a solution is not obtained with W_p at a certain value, but a solution is obtained using another value.

3) By varying the W_p values randomly for every repetition, solutions are obtainable for more target values.

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