Figure 15: (a) The usual generalization performance of the 1-6-1 Complex-BP (Input: Learning pattern #1 in Fig. 14(a), Target: Learning pattern #2 in Fig. 14(b)). The 12 dotted lines denote the input test pattern, and the solid lines the output test pattern.

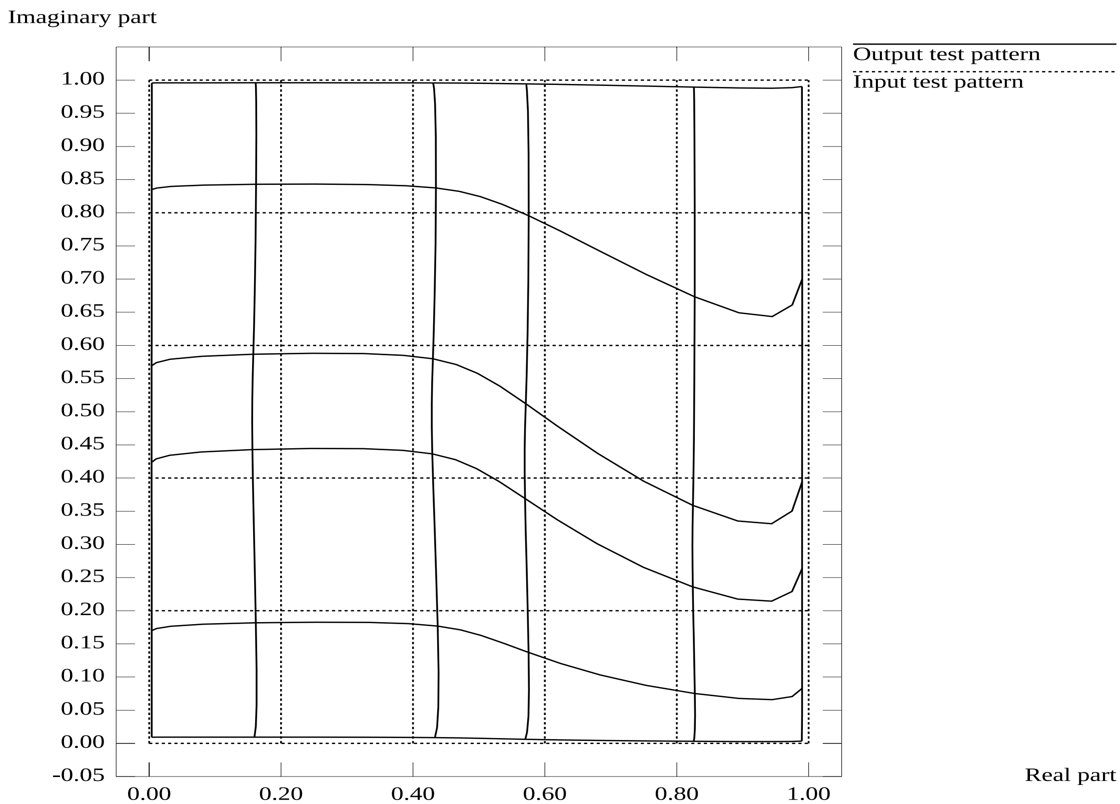

Figure 15: (b) The usual generalization performance of the 2-12-2 Real-BP (Input: Learning pattern #1 in Fig. 14(a), Target: Learning pattern #2 in Fig. 14(b)). The 12 dotted lines denote the input test pattern, and the solid lines the output test pattern.

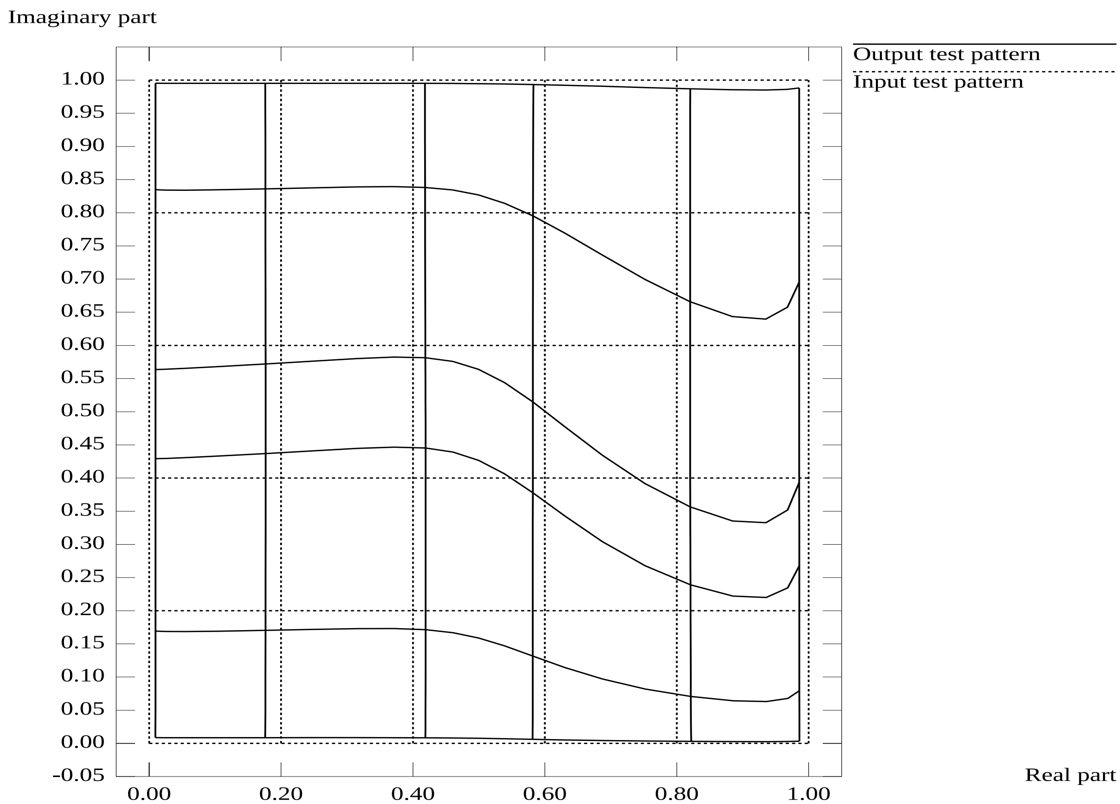

Figure 16: (a) The usual generalization performance of the 1-6-1 Complex-BP (Input: Learning pattern #2 in Fig. 14(b), Target: Learning pattern #1 in Fig. 14(a)). The 12 dotted lines denote the input test pattern, and the solid lines the output test pattern.

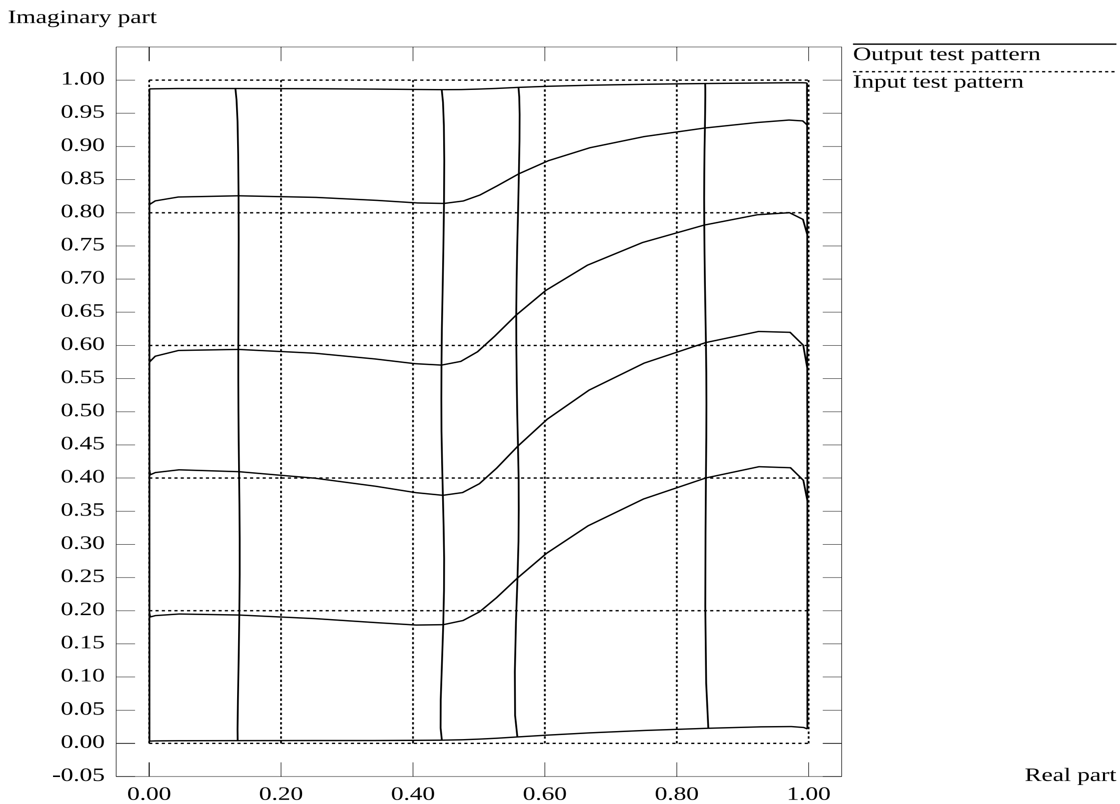

Figure 16: (b) The usual generalization performance of the 2-12-2 Real-BP (Input: Learning pattern #2 in Fig. 14(b), Target: Learning pattern #1 in Fig. 14(a)). The 12 dotted lines denote the input test pattern, and the solid lines the output test pattern.

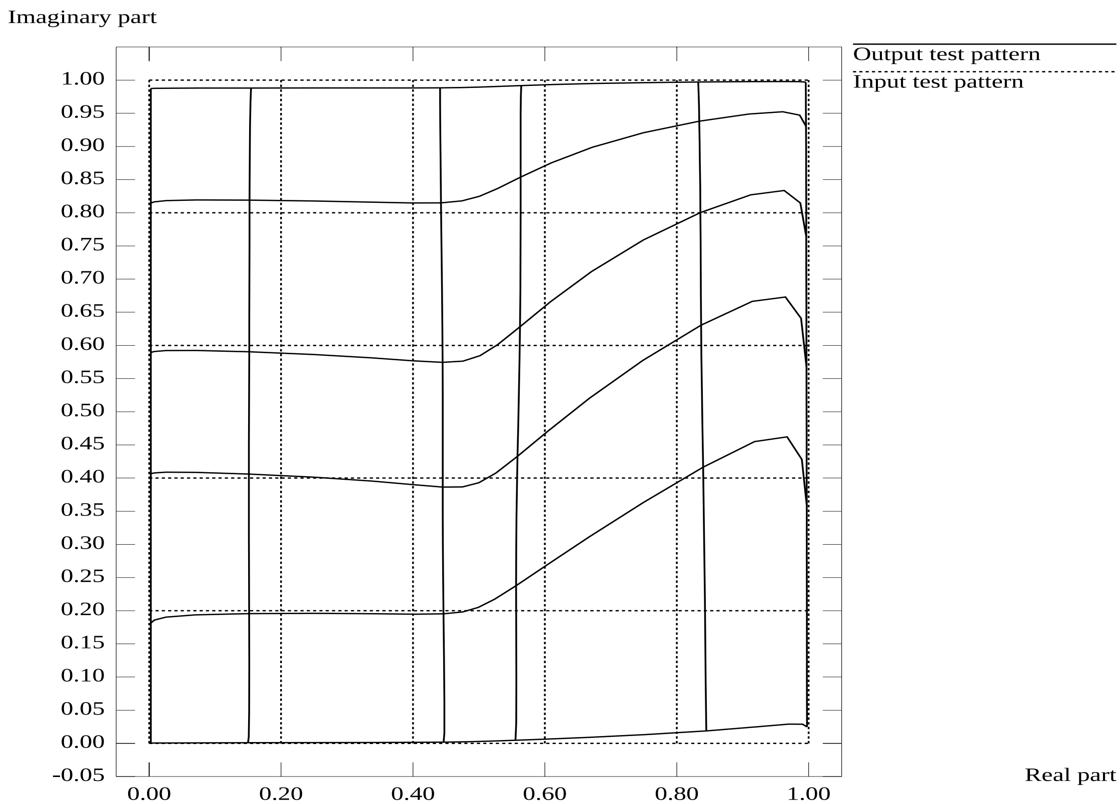

Figure 17: An image of the error back propagation in the Complex-BP. The meanings of the symbols are as follows: $x = \Delta\gamma_n^R, y = \Delta\gamma_n^I, a = \Delta v_{nm}^R, b = \Delta v_{nm}^I, c = \beta_m, h = |H_m|$.

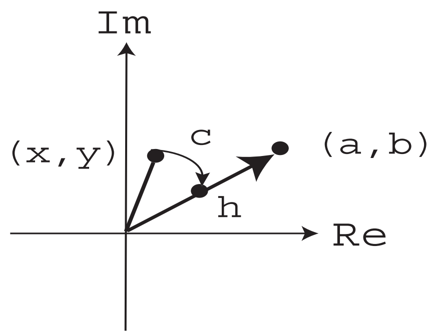

Figure 18: An image of the error back propagation in the Real-BP. The meanings of the symbols are as follows: $a = \Delta\gamma_n, b = \Delta v_{mn}, h = H_m$.

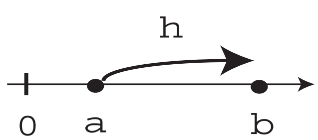

Figure 19: Factors to determine the magnitude of change of learnable parameters. The starting point of an arrow refers to a determination factor of the end point.

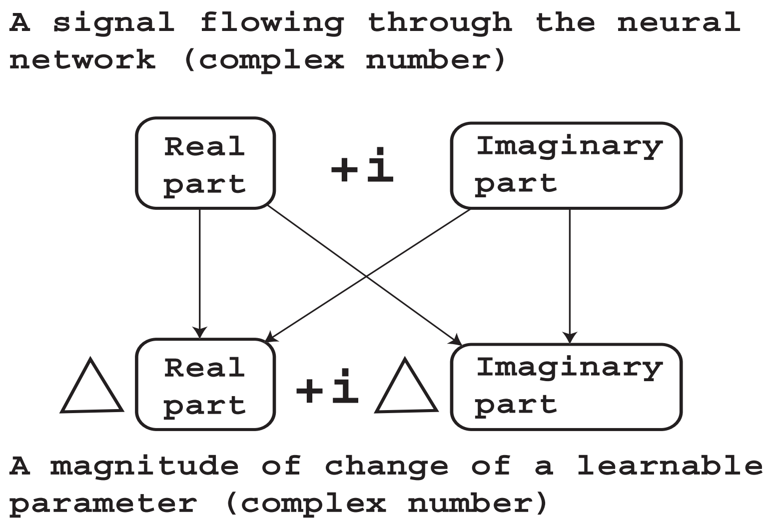

Figure 20: Derived function of the sigmoid function $f_R(u)$.

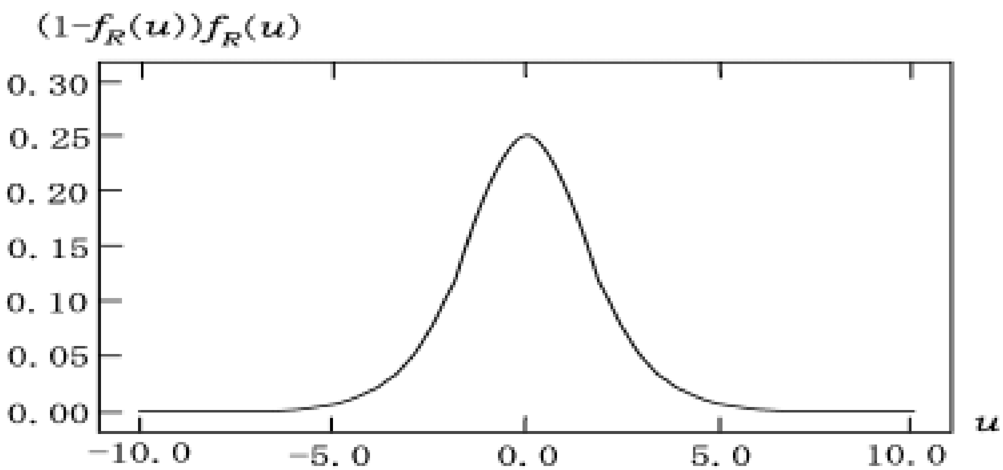

Figure 21: Learning and test patterns used in the mathematical analysis of the behavior of a Complex-BP network which has learned the counterclockwise rotation of the points in the complex plane by α radians around the origin. The circles, triangles, and squares (black or white) have the same meanings as in Figure 8, and $C = \alpha$ and $D = \phi$.

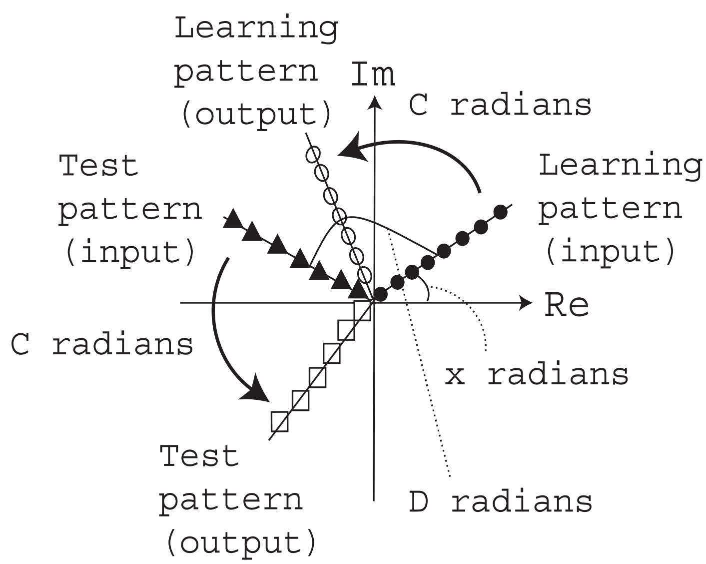

Figure 22: Learning and test patterns used in the mathematical analysis of the behavior of a Complex-BP network which has learned the similarity transformation with the similitude ratio β in the complex plane. The circles, triangles, and squares (black or white) have the same meanings as in Figure 8, and $B = \beta$ and $D = \phi$.

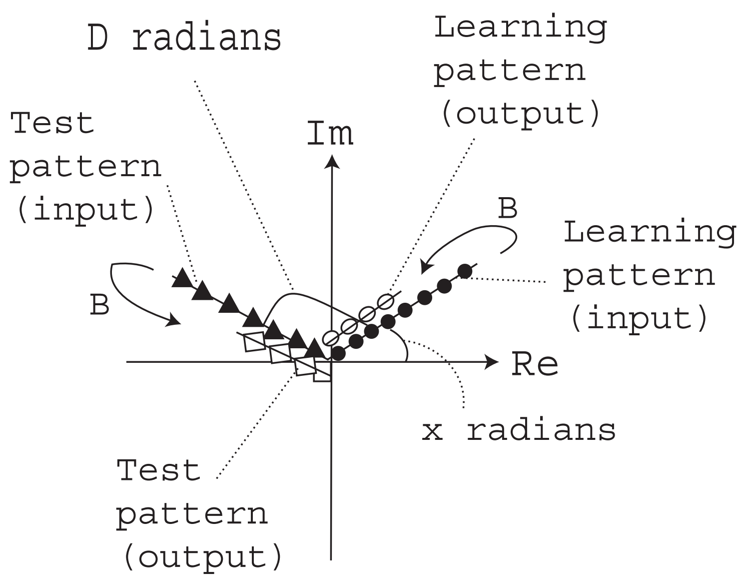

Figure 23: Learning and test patterns used in the mathematical analysis of the behavior of a Complex-BP network which has learned the parallel displacement of the points with the parallel displacement vector γ in the complex plane. The circles, triangles, and squares (black or white) have the same meanings as in Figure 8, and $C = \gamma$ and $D = \phi$.