the generation of an "eagle alarm call" by the primary response network in a case where the expectation node Y does not detect an audible "eagle alarm call" generated by another agent, or

the non generation of an "eagle alarm call" by the primary response network in a case where the activation node X is triggered and the expectation node Y does detect an audible "eagle alarm call" generated by another agent.

[0049] In this experiment, the associative memory received an input signal from a further sensor S_1 detecting whether the observed flying object was or was not yellow in colour. In cases where the behaviour of the primary response network was determined to be abnormal (by analysis of the signals O_1, O_2, and O_3 output by the activation node X, expectation node Y and motor centre M), the associative memory updated the appropriate weight applied to the output of the "yellow object" detector S_1. In this experiment, since eagles are not yellow, at times when negative reinforcement of the motor centre M was required the output signal from the "yellow object" detector would often be high. Thus, the architecture gradually developed conditioning such that the motor centre M would not produce an output for the generation of an audible "eagle alarm call" signal in cases where the output from the "yellow object" detector S1 indicated that the flying object was yellow.

[0050] Figures 5, 6 and 7 are graphs illustrating the results that were obtained in the "eagle alarm call" experiment. In this experiment, the weights used in the associative memory were initially set to 0.01, and in equation (5) τ was set to 10 and c_j was set to

$$15.0 \div \prod_{a=1}^{j} a.$$

During the experiment, the architecture was alternately presented with the sets of values indicated in Table 1 below:

Table 1

Name of Set of Values	Input to Activation Node ("Flying Object" Sensor)	Input to "Yellow Object" sensor	Input to Expectation Node ("Eagle Alarm Call" Sensor)
Yellowbird	1.0	1.0	0.0
Eagle	1.0	0.0	1.0
DetectedAlarm	0.0	0.0	1.0

[0051] More particularly, during the first 100 time steps in the experiment, the set of signals "Yellowbird" was presented to the architecture, then during the next 100 time steps the set of signals "Eagle" was presented, then during the next 100 time steps the set of signals "DetectedAlarm" were presented, and then the sequence repeated.

[0052] Figures 5a) to 5d) illustrate how the output signals from the activation node X, expectation node Y and motor centre M changed during the experiment: in each case the x-axis indicates the number of time steps which has elapsed, whereas the y-axis indicates the value of the signal output by the nodes X, Y and M in Figs.5a), b) and c) respectively, 1.0 indicating triggering of the X and M nodes and detection of a "non-expected input" by the expectation node Y, whereas 0 represents no triggering of the X and M nodes and detection of the "expected input" by the expectation node Y. Fig.5d) groups all 3 outputs on a single graph.

[0053] It will be seen from Fig.5 that the architecture does indeed, after about 1300 time steps, learn to correctly respond to the set of input signals "Eagle". Furthermore, even for presentation of the "DetectedAlarm" set of signals, the motor centre will often output a signal to trigger generation of an audible "eagle alarm call".

[0054] Figures 6a) and b) indicate how the values of the positive and negative reinforcement signals, respectively, change during the experiment. Fig.6c) groups the two responses on a single graph. A signalling pattern is quickly established with respect to negative reinforcement y-, namely, the strongest negative reinforcement is seen for the presentation of the "Yellowbird" set of signals, medium-level negative reinforcement is seen for the presentation of the "Eagle" set of signals and almost no negative reinforcement is seen when the "DetectedAlarm" set of signals is presented.

[0055] With respect to positive reinforcement, the pattern is not as marked because positive reinforcement depends upon the probabilistic output from the motor centre M as defined in equation (1). An initial tendency of y+ was to output a positive value for a short period of time just after replacement of the "Yellowbird" set of signals by the "Eagle" set of signals. However, after 1300 time steps this tendency changed: a positive value continued to be output when either the "Eagle" or "DetectedAlarm" set of signals were presented but then it began intermittently to produce a much stronger value as an output value of y+. This intermittent stronger output of y+ enables the architecture to have a positive reac-