The aim of this work was to develop a mathematical decision-making procedure that might become a basis for real-time pattern recognition studies of the brain's neuroelectric responses. Data were collected from 77 volunteers under the auditory oddball paradigm with standard (1000 Hz) and deviant (2000 Hz) stimuli. The participants counted the deviants and reported them at the end of the experimental session. Event-related potentials (ERPs) were recorded and filtered with a bandpass between 0.16 and 70 Hz (3 dB down, 12 dB/octave) at Fz- and Pz-recording sites. The most significant potential values that discriminated the responses to the deviant stimuli group were at 136, 224, 328, 348, and 350 ms for Fz, and at 166, 220, and 350 ms for the Pz. The 328, 348, and 350 ms potential values define the curvature of the P300 peak; the 224 ms potential at Fz, and the 220 ms at Pz define that of the N2b peak. The differentiation between the deviant and standard group was checked through a discriminant function that allowed prediction of group membership; 98% of the ERP responses were correctly identified. The results showed that statistically derived time-points were congruent with the P300 and N2b ERP curvature.