

Abstract Submitted
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Resonating Vector Strength: How to Find Periodicity in a Time Sequence¹ J. LEO VAN HEMMEN, Physik Department T35, TU Muenchen — For a given periodic stimulus with angular frequency $\omega_o = 2\pi/T_o$ we find responses as events at times $\{t_1, t_2, \dots, t_n\}$ located on the real axis R . How periodic are they? And do they repeat in “some” sense in accordance with the stimulus period T_o ? The question and the answer are at least as old as a classical paper of von Mises dating back to 1918. The key idea is simply this. We map the events t_j onto the unit circle or torus through $t_j \mapsto \exp(i\omega t_j)$ and consider their center of gravity, $\rho(\omega)$, a complex number in the unit disk. Its absolute value $|\rho(\omega_o)|$ with $\omega := \omega_o$ is what von Mises studied and is now called the vector strength. We prove that the nearer $|\rho(\omega_o)|$ is to 1 the more periodic the events t_j are w.r.t. T_o . Furthermore, we also show why it is useful to study $\rho(\omega)$ as a function of ω so as to obtain a ‘resonating’ vector strength, an idea strongly deviating from the classical characteristic function.

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