1057-03-55 **Takashi Gyoshin Nitta*** (nitta@edu.mie-u.ac.jp), Kurimamachiya 1577, Tsu, Mie 514-8507, Japan, **Ives Peraire**, Aubere, 62177 Clermomd-Ferrond, France, and **Dapeng Cai**, Furo-cho, Chikusa-ku, Nagoya, Aichi 464-8601. *Divergent Fourier Analysis Using Degrees Of Observality and Solving Undiscounted Infinite Horizon Optimization.*

(1)The aim of this work is to generalize the methods of Fourier Analysis in order to apply them to a wide class of possibly non integrable functions, with infinitely many variables. The method consists in distinguishing several levels of observability, with a natural meaning. Mathematical coherence is ensured by the fact that these natural concepts are represented within a sure mathematical framework, that of the relative set theory . This work is also a step for an other approach of the Fourier transform of functionnals. It can be related to the one, which use double extensions of standard real numbers, performed by T. Nitta and T.Okada. (2)Undiscounted infinite horizon optimization problems are intrinsically difficult because (i) the objective functional may not converge; (ii) boundary conditions at the infinite terminal time cannot be rigorously expressed in the real number field. We demonstrate that under a hyper-real terminal time, there exists a unique optimal solution in the hyper-real number field. We show that under fairly general conditions, the standard part of the hyper-real optimal path is the optimum among all feasible paths in the standard real number field, in the sense of two modified overtaking criteria. (Received December 25, 2009)