THE COMPUTATIONAL STRENGTH OF INFINITE TIME REGISTER MACHINES

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Abstract. We show that a real $a \in^\omega 2$ is computable by an Infinite Time Register Machine (ITRM) as defined in [1] iff $x \in L_{\omega_\omega^{\mathsf{CK}}}$ where $\omega_\omega^{\mathsf{CK}} = \sup_{n<\omega} \omega_n^{\mathsf{CK}}$ is the supremum of the first ω admissible ordinals. This corresponds to the fact that an ITRM with 0 input and empty oracle either halts before time $\omega_\omega^{\mathsf{CK}}$ or it does not halt at all. So the halting times of such machines are cofinal in $\omega_\omega^{\mathsf{CK}}$, i.e., $\omega_\omega^{\mathsf{CK}}$ is the supremum of the ITRM clockable ordinals. Moreover we expect exact dependencies between the number of machine registers and the number of admissible ordinals needed.

References

[1] Peter Koepke, Russell Miller. An Enhanced Theory of Infinite Time Register Machines. CiE pp.306-315 (2008)