Chapter 7

CONCLUDING REMARKS

An approach to a scale-invariant non-linear analysis on R is presented. In a computational problem a number $x = 1$, for example, is represented up to a finite accuracy; i.e., up to a scale ϵ, say. Then the numbers in the interval $(1-\epsilon, 1+\epsilon)$ are computationally unobservable and identified, as a whole, as the number 1. The non-trivial construction presented in this thesis now tells that the points in that computationally inaccessible limiting interval may get aligned dynamically as non intersecting clopen balls of a Cantor set C endowed with the non-trivial ultra metric value, thereby extending the ordinary real number set R to an infinite dimensional, scale free, non-archimedian space **R** accommodating dynamically active scale invariant infinitesimals and infinities.

Because of scale invariant infinitesimals, a non zero real variable x (> 0) say, in R approaching 0 now gets a pair of deformed structures living in an associated deformed real number system $\mathcal{R} \supset R$ of the form $\mathcal{R} \ni \mathcal{X}_{\pm}(x) = x.x^{\mp v(\tilde{x}(x))}$, thus mimicking non-trivial effects of dynamic infinitesimals over the structure of real number system R.

In this thesis we have studied a few non-trivial influences of the dynamical infinitesimals in the asymptotic estimates of number theory, more specifically prime number theorem. We have also presented some applications of dynamical infinitesimals in some simple ordinary differential equations and also in diffusion equation leading to the emergence of anomalous mean square fluctuations when a diffusive system is allowed to execute motion over infinitely long time scales.

We aim to make more detailed applications of this nonlinear analysis to other well known differential equations as well as dynamical systems in future. Applications to analytic number theory and fractal sets will also be considered. The status of homotopy analysis method in the present formalism will also be explored [67].