**Dr Micheal Mac an Airchinnigh**

Dr Mac An Airchinnigh is a senior lecturer at Trinity College in Dublin, Ireland. He is a former chairman of ADA Europe, a co-founder of Formal Methods Europe, a director of ISCN, the head of the formal methods group in Ireland, and is currently analysing the IEC 61508 standard and concepts applying the formal methods background. IEC 61508 is the standard-to-be for safety systems based on the concept of Safety Integrity Levels (SILs 1-4). With increasing SIL level the probability of occurrence of a dangerous failure must be decreasing. The standard describes (highly) recommended practices for each SIL level and many of them at higher SIL levels (>=3) describe the need of formal methods. This tutorial will use 18 years of formal methods experiences in different fields to investigate: What is the way of thinking when moving from coding views to formally proved design views? How do we relate Product Safety Terminologies to Evidence for Certification on the Semantic Web? and Why is the Semantic Web Ontology Language (for Web Services) (OWL-S) a practical way forward? World-Wide IEC 61508 compliance will be greatly facilitated by knowledge representation (KR) of relevant concepts of safety and corresponding product properties (in Description Logic of OWL) on the Semantic Web. In all safety-critical fields such as automotive, aerospace, medical, etc. there is an increasing demand for ease of compliance, driven by the manufacturers.

**Scientific Background in Formal Methods**

See also the Trinity College Web Site: http://people.tcd.ie/mmacanai

RECENT RESEARCH ACHIEVEMENTS (LAST 5 YEARS). (1) MATHEMATICS OF COMPUTING (D, T): In the field of Applied Constructive Mathematics I have found a way (presented 1996) in which to exploit and develop the use of geometry/topology in formal specifications. Starting from the initial hypothesis that the mathematics used in the modelling/specification of computing systems should be universal, in the sense that it be equally suitable for the modelling of natural systems, viz., physical, chemical, biological, or cosmological, and vice-versa, I demonstrated a method of development that promises to lead into a fruitful area of exploration for both research and pedagogy in the general field of dynamically distributed systems. In the process, I have demonstrated that there is a geometry/topology of formal methods, complementary to the usual algebra of formal methods and have shown how the geometry may be used in practice in the formal specification of systems. The results were immediately applicable to the model-theoretic formal methods such as VDM and Z. (Mac an Airchinnigh 1997a) In the following year I focussed on (i) the act of distributing and (ii) the resulting distribution both of which are notions which lie at the kernel of any distributed system. The basic algebra of such distributions and their use in formal specifications had already been developed in terms of indexed monoids (i.e., function spaces with valuations in monoids) and their morphisms (originally presented 1993). Complementary to such algebra is a body of emerging geometry/topology of formal specifications, one critical aspect of which is the fibre bundle, and more generally the sheaf. Fibre bundles are used to model the nature and shape of geometrical objects and to associate a field with points in a

space. They find particular application in theoretical physics. (1) MATHEMATICS OF COMPUTING (A, T): One of the essential aspects of Applied Constructive Mathematics is naturally a demonstration of applicability. In my case, I have focussed, though not exclusively, on the construction of models in the Software Engineering Sector. Within the reporting period in question (1994 to 1999) one of the more interesting areas of application was a study of the "Testing of Requirements." (2) APPLICATIONS OF COMPUTING (D): Work on the re-construction and re-presentation of the Chester Beatty p46 Greek papyri containing the earliest record of the Pauline Epistisles was begun in 1991. That work has continued throughout the decade and is now near completion. A first public address (3 hours) on the subject was given by invitation at the 3 week Summer School on Digital Preservation of Medieval Manuscripts and Early Printed Books, Sofia, Bulgaria, 25th July -- 13th August, 1999. Publication is in preparation. (3) PHILOSOPHY OF COMPUTING (I, T): I proposed an examination of the technologies underlying the InterNet and the World Wide Web and from an exhaustive analysis based on experience, proposed means by which we might form our own futures. The inter-relationship between a people, its society and the science/technology of the day were looked at from the essential perspective of ensuring a "human society" in which the individual might "feel at home." (Mac an Airchinnigh 1996). (3) PHILOSOPHY OF COMPUTING (A, T): Philosophy does have its applications. For many years I have taught the basic principles of Aristotelianism in the "Computers and Society" degree course and exhibited their applicability to computing. One of the first papers of same was in a study of Service Engineering in the Telecommunications Sector (Mac an Airchinnigh and Kugler 1994). (4) PEDAGOGY OF COMPUTING (T). ***RESEARCH GROUP: (FMG) Foundations and Methods Group

Private Data

Birthdate:                         30.3.1950
Citizenship:                       Ireland
Familiy Status:                    Married, 2 children