1996 Paper 1 Question 6

Foundations of Computer Science

This question has been translated from Standard ML to OCaml

Give the declaration of an OCaml variant type that could be used in the representation of a lazy list of integers, and illustrate its use by defining a function `ints` that when given an argument `n` yields a lazy list of integers from `n` to infinity. [5 marks]

The decimal representation of a real number in the range 0 to 1 is to be represented as an infinite sequence of the decimal digits following the decimal point ($0.d_1d_2...$). Define a function `mknumb` which when applied to the digit function `dig` will construct a lazy list of these digits where the ith digit (d_i) is given by `dig i`. [5 marks]

Suppose we have an infinite sequence of such numbers $[r_1, r_2, ...]$, in which the digits of the decimal expansion of r_i are given by the digit function f_i, and that the collection of digit functions is represented by the lazy list $[f_1, f_2, ...]$. Define suitable types for the list of numbers and the list of digit functions. [5 marks]

Define a function `newnumb` which when given the lazy list of digit functions will yield a lazy list of digits that have the property that its ith digit differs from the ith digit of r_i. [5 marks]