Technical Subject:

Public information system for remote monitoring and control of forest fire-induced enviromental health risk.

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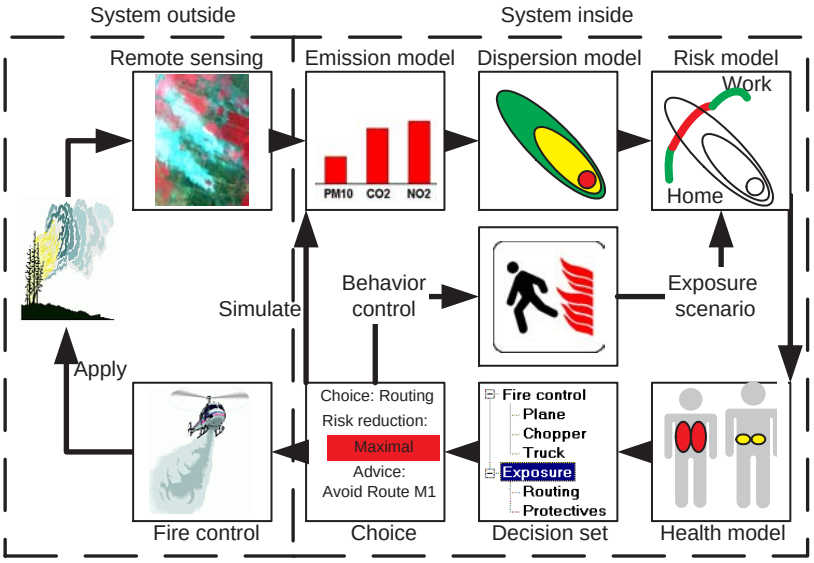
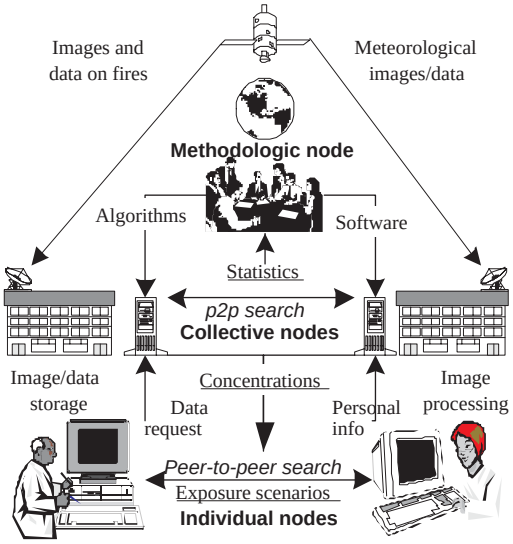


Information processing algorithm: in the system (Inside); by external agencies (Outside)



The network structure

Goal & Contribution to well-being for all humanity :

Our goal is to bring together three advanced but hitherto separate technologies: remote sensing of forest fires, health risk assessment, and Internet. The result will combine the publicity and easy sustainability of peer-to-peer networks and the expertise of forest fire/public health excellency centers. This will open the way for the users to self-control their quality of life using modern science and technology, without necessarily being expert in both.

Objective:

Create the prototype information system that will establish the informational feedback between the institutional sources of remote sensing information on forest fires and the individual or institutional users of fire-related health hazard information. The system will provide its users with the assessment of health risk they run and with behavior advice that would let them minimize the risk. In exchange, it will collect from them information on their exposure scenarios and health status, to improve risk assessment.

Method / Approach :

We rely on the existing solutions for 1) remote detection and classification of forest fires, 2) assessment of health risk from air pollution by smoke plumes and 3) information exchange in peer-to-peer networks. These are three tiers of the proposed system. Their combination in the system design is the core of the project. The novelty consists in the organization of information exchange mutual constraints so that each tier alleviates the problems of other tiers.

Tier 1. For application to health (Tier 2), only large fires existing near densely populated areas need to be detected in remote sensing images. This is the relatively easy problem a), routinely solved in many processing centers, including the Space Research Institute. Then, each fire will be classified into 4-5 well established categories and its energy balance will be estimated (b). This will provide the necessary parameters for the emission model of pollutants. Then, the atmospheric short- or long-range dispersion model will be applied, based on the global meteo data and the parameters of plume visible in remote sensing images (c). The resulting expected concentrations will be the output of Tier 1. For a) and c) the free NOAA data are adequate, while b) requires MODIS-type data or more.

Tier 2 will use the standard risk assessment algorithm based on pollutant concentration pattern and exposure scenarios. Individuals will enter their personal scenarios to obtain personal risk. Personal sensitivity modifiers can be applied and risk dynamics can be validated by actual personal health change. Comparing the predicted health status to actual one provides the feedback, on which risk control through behavior advice is based. Institutions can use the same approach, to obtain populational risks. The feedback on health status will be collected from individual users of the system since fires induce fast, transitive risks.

The prototype of Tier 2, called EHIPS (Environmental Health Information Processing System), was developed in Space Research Institute as a standalone module.

Tier 3 - the network - carries the key element of the project: the logic of information exchange.

It will use Internet as the information channel. The software pieces - nodes - will be freely downloadable by individuals and institutions.

The basic node system will be amorphous, peer-to-peer. The software will include agents for accessing remote information on current forest fires, public meteo and GIS data etc. Also, there will be search and exchange agents. Some of the nodes - perhaps, the institutional ones - could be upgraded to collective processing centers performing the Tier 1 tasks in automatic or supervised regime or just interfacing the node owner's special image processing software.

What will be done :

1. Identify data sources, necessary protocols and models used for relating remote sensing data to health risk. Develop the system architecture.
2. Produce the node software and test it in-team, on Space Research Institute data.
3. Distribute the software on Internet for beta-testing on a wide spectrum of data and users.
4. Transfer the prototype system to a supporting agency or firm. Start methodological site.