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Air Pollution and Health Risk: Intelligent Mapping

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Abstract

Air pollution by chemical or bacteriological pollutants is not limited to a geographical area at the discrete border. Also, factors taken into account in the risk analysis such as patient age, seasons, socio-economic background or race are far from being necessary as discrete values. Often used analysis tools are limited to statistical analyzes. Given the nature of this data, imprecise and complex, in this study we propose an artificial intelligence tool, in particular the principles of fuzzy logic in data processing. A fuzzy system is constructed with five fuzzy input variables (Nature of the pollutant, geographic area, season,) and an output variable which expresses the corresponding health risk in terms of disease with its incidence rate. The rule base must contain all possible combinations. This tool can be used as a tool to aid in the prognosis and in the prevention of the onset of epidemiological diseases.

Keywords:
Air pollution, Risk factors, Intelligent systems, Fuzzy logic

Introduction

The estimate of air pollution is expressed as air quality. Scales are established and based on statistical models [1]; [2]; [3]; [4] [5]. The effect of a pollutant affects people differently because of their different physiology. Also, a pollutant is not limited to a given border in order to be able to estimate its impact on a population in a given area [6].

The analysis of these parameters using fuzzy logic is then perfectly adequate.

The fuzzy approach, a subdomain of intelligent systems and as such it is used in different applications. The variables analyzed are linguistic for compensating the uncertainties inherent to the measurements [7]. A fuzzy system is built allowing the analysis of the pollutant effect in a given geographical area and its possible extension to neighboring areas.

Methods

A fuzzy system is constructed with three fuzzy input variables (nature of the pollutant, geographical area, season) and an output variable which expresses the corresponding health risk. In terms of disease with its incidence rate (Figure 1). A base rule is established to link all inputs to output. The rule base must contain all possible combinations. As the calculation of the output result takes into account the fuzziness of the variables, i.e. it takes into account the uncertainties inherent in the measurements of the input and output variables of the system, the result will be the more precise possible. This tool can be used as a tool to aid in prognosis and prevention of the onset of epidemiological diseases.

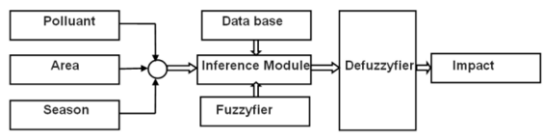

Figure 1. *Block diagram of the system*

Conclusion

The effect of air pollution on the population is based on a fuzzy logic model. It is designed to measure the impact of it. The system has three inputs and one output. Each input or output variable is fuzzyfied. A base of rules linking the inputs to the output is provided (Figure 2). The result is the random assignment of values at the input to instantly read the result at the output in numerical and symbolic terms. This helps predict the impact of each input parameter on the public health outcome.

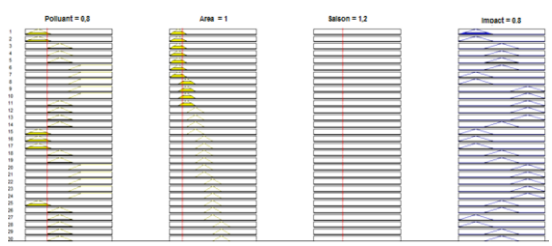

Figure 2. *Example of application*

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