

MATLAB TUTORIAL: KULTURISK RISK ANALYSIS

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Introduction

KULTURISK Methodology (Balbi et al., 2012) for the demonstration of the benefits of risk prevention was designed and successfully tested on a few European case studies with varying socio-economical, physical and hazard characteristics (KULTURISK Project). Knowledge and experience emanating from application of the methodology was used to design a tutorial to give students insight and understanding of the methodology. This tutorial was predominantly a programming language MATLAB (MathWorks, 2004) exercise with the following learning objectives;

- Debugging a piece of MATLAB code
- Manipulation and operations involving matrices
- Input-output operations
- Writing and use of anonymous functions (and the use of normal functions)
- Basic implementation of interactive MATLAB content
- MATLAB operations, writing equations in code
- Use of Boolean operators
- Slicing of matrices

To achieve the stated objectives it was designed as Risk Assessment of a 'pseudo case study' taking into account a Physical risk and Economic assessment. For purposes of scope and available time, Social assessment was not carried out, due to inability to comprehensively analyse the required data in the allocated time.

Risk assessment Receptors

Using a partially filled piece of code with intentional errors, participants were expected to refer to the KULTURISK methodology to get equations and explanations to convert supplied data and to complete the code, thus at the end, they would achieve the learning objectives.

People, buildings, road network and agriculture were taken as the receptors in the floodplain. Whereby exposure of buildings and people was based on urban areas derived from landuse maps, taking into account population density and (approximate) building coverage area.

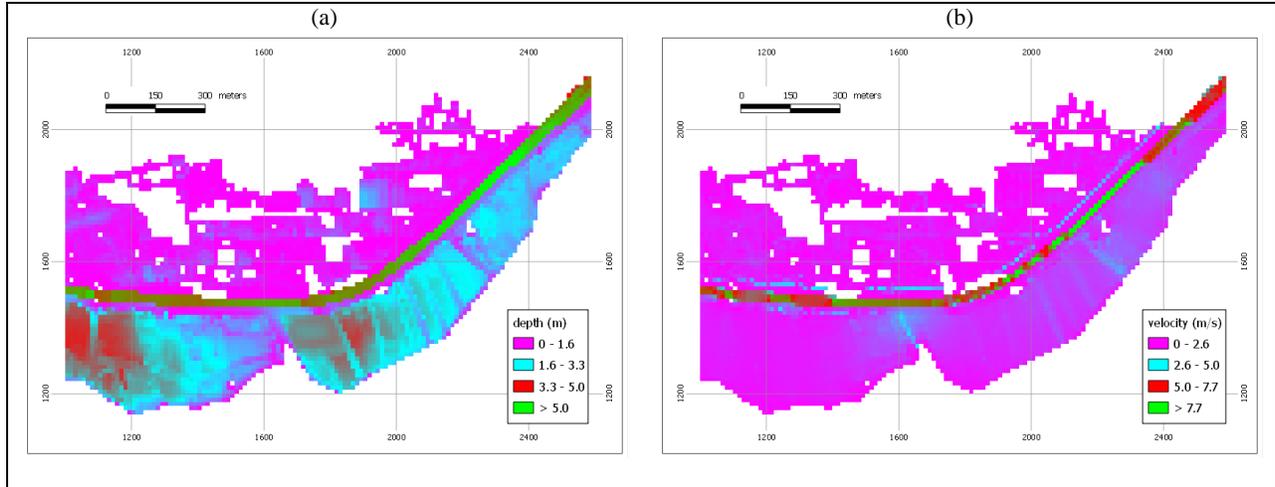


Figure 1: Supplied data: Flood hazard (a) depth (b) velocity

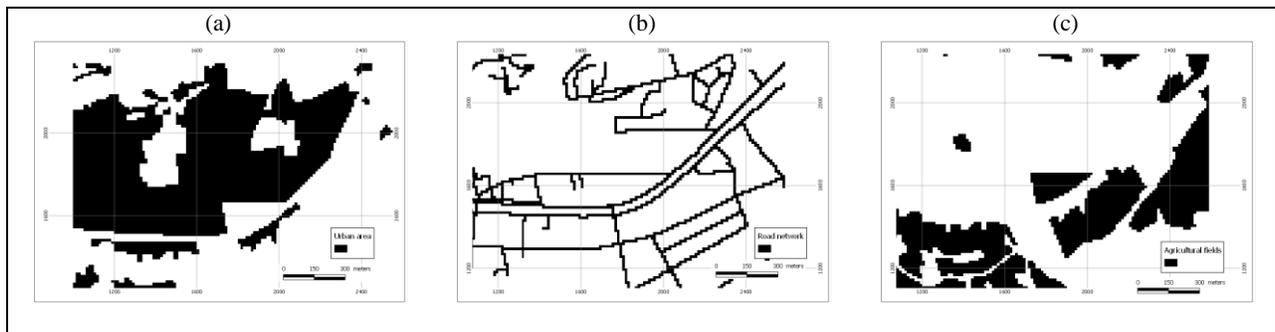


Figure 2: Supplied data (a) urban area (b) road network (c) agricultural fields

Participants, at the end of the tutorial, would be expected to study output risk maps (reflecting on the choice of parameters and indicator values) to gain some experience of a decision making process and resulting effects. Given time, a sensitivity analysis may also be carried out to compare different outputs.

Conclusion

This tutorial was a simplified example, scaled and adapted to be completed in a three hour tutorial session. A basic understanding of the programming language to be used was required. It was found to be informative, especially achieving dual purpose of (i) introduction to risk analysis using the KULTURISK methodology (ii) introduction of semi-advance programming.

Given, adequate time, this tutorial can be easily broadened to take into account determination of hazard extent, using flood inundation modeling techniques (e.g. Dottori and Todini, 2011), Social assessment of risk to receptors, varying case studies, datasets (e.g. Bates, 2012) and also implementation in alternative programming languages. The methodology has been shown to be scalable and adaptable to many conditions of implementation.

References

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