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Snowmaking in ski resorts: spatial decision support for management of snowpack

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Since the early 2000s, the question of snowmaking that ensures activity in ski areas is controversial, because solutions to face climate change and sustainable development seem to be opposed to the economical needs of winter tourism. Actually, according to the Advisory Body on Climate Change (OCCC), we can expect an average rise of the limit of 0 degrees to 360 m in 2050. The application of the rule of 100 days (30 cm of snow for 100 days) shows that 1 ° increase in temperature reduced by 20% the number of viable skiing areas.

Snowmaking seems thus to be a solution for continuing an optimal economical usage of the ski resorts. The usage of machine-made snow raises environmental issues which can no longer be denied. [Badre et al.2009] However, these issues should not be disconnected from local economic specificities of the high mountain valleys, where the ski economy is critical.
This paper presents a study at the economic-environmental interface. The aim is to develop a tool for managing the production of artificial snow, with the goal to:
• Reduce production costs and improve profit margins of companies operating ski areas;
• Reduce environmental impacts by an optimized snow production “just in time”. In this way, water and energy needs will be reduced.
The problem of managing the snow is a highly complex problem: it cannot be solved analytically. Indeed, changes in height of snow are subject to intakes of snow (natural or manufactured) associated with changing weather conditions and the impact of skiers.

Therefore, the work presented in this paper has chosen a probabilistic approach in a simulation using neural networks to predict and to manage snow height. We do this in two points:
• We measure snowpack heights with radars mounted on grooming machines;
• We produce a snow cover prediction in relation with weather prediction using a neuron network. This neural approach thus deals with the spatial prediction of snow cover [Kanevski et al., 2009]

The result is a map of probable heights provided to stakeholders, allowing them to adjust their production strategy based on the situation.

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