AI AND PATTERN RECOGNITION; PANEL DISCUSSION

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This panel deals with the relationships between artificial intelligence and pattern recognition. It addresses such issues as: How do the fields differ? How should they relate to one another? In particular, does AI have anything to learn from PR?

Pattern recognition, classically, involves the extraction of features and their subsequent analysis in feature space using statistical tools or clustering heuristics. There is certainly an interesting class of problems that can be approached in this way, but for the problems of central interest in A.I., the feature space idea seems inappropriate, leaving feature extraction as an area of useful overlap between the fields.

An alternative pattern recognition paradigm is that of syntactic analysis, in which patterns are hierarchically decomposed into subparts, and recognition of an unknown pattern is basically a parsing process, where the pattern is first segmented into primitive parts, and combinations of these parts are matched against the rules of a "pattern grammar". This approach is somewhat more powerful, since it deals with structural descriptions rather than with unstructured feature vectors. However, from an AI standpoint, syntactic analysis is of limited usefulness if it makes no provision for using semantic knowledge about the patterns being analyzed.

On the other hand, there is something very appealing in the classical ideas of pattern recognition. The search for generality has become unpopular lately in AI. This is not because generality is undesirable, but because it is so incredibly difficult to achieve. The ideas of pattern recognition provide uniform algorithms of great generality which require only changes in numerical values for their application to a new problem. It is worth considering how the paradigms of pattern recognition are relevant to achieving generality in areas such as image analysis.

It should also be pointed out that even in AI systems for tasks such as scene analysis, some use of pattern recognition methodologies is almost unavoidable. Such systems need to segment images into parts, just as in syntactic pattern recognition; to measure geometrical and textural properties of the parts, and to identify or classify the parts on the basis of these properties,just as in statistical pattern recognition. Advances in segmentation, feature extraction, and classification techniques are being made by both schools; they have more in common than is sometimes realized.

AI is centrally concerned with theoretical issues, but it has used a variety of practical tasks, e.g., in image and speech understanding, as test beds for studying machine perception. Pattern recognition has also dealt extensively with these same tasks, but traditionally, has studied different classes of inputs, taken from areas such as document reading, remote sensing, and medicine, rather than industrial automation. There are significant differences among these classes of scenes, but there are also many common problems. The overlap in applications is growing, and should lead to greater communication between the fields.