Coherent opitical pattern recognition

David Casasent

(Carnegie-Mellon University, Department of Electrical Engineering)
Pittsburgh, Pennsylvania 15213

The flexibility and repertoire of optical pattern recognition (OPR) techniques require expansion if the parallel and real-time processing features of opticla processors are to be realized in practical applications. The frequency plane correlator has been the hallmark of OPR systems for 15 years.

Recent refinements in this system such as weighted matched spatial filter synthesis have been effectively applied to practical PR problems when geometrical image distortions and multi-sensor intensity differences are present between the input and reference imagery.

Following a review of such techniques, we consider another specific case study (optical word recognition) in which data normalization and alternate detection criteria issues are raised. This is followed by a description of four advanced hybrid optical/digital hybrid processing PR techniques.

These include: a microprocessor-based hybrid processor, space-variant optical PR using coordinate transformations to realize scale and rotation invariant processors; PR using invariant moments; and a hyperspace feature space analysis with approporiately generated discriminant functions.

Such advanced hybrid optical/digital PR methods and techniques have greatly expanded the operations achievable in optical systems. They have also fostered directed OPR attention to practical and realistic PR applications.

相干光学图案识别

David Casasent

（卡内基·迈隆大学电气工程系）

如果要使光学处理机的平行和实时处理特征得以在实际应用中实现的话，那么光学图案识别技术的灵活性和全部技能需要有一个发展。频率平面相关器十五年来一直是光学图案识别的试金石。

当输入和参考图形之间出现多传感器强度差别和几何图象畸变时，在这种系统中，象权重匹配空间滤波器综合这样的精细的改进，最近已被有效地用在实际图案识别问题中。

本文在综述这类技术之后，还讨论了另一项特殊研究（光学文字识别），其中提出了数据标准化和交替探测判据问题。之后，我们叙述了四种先进的混合式光学/数字混合处理图案识别技术。

它们包括：以微处理机为基础的混合处理机，应用坐标变换来实现比例和旋转不变的处理机的空间变化光学图案识别；应用不变矩的图案识别；以及用专门生产的鉴别函数进行超空间特征的空间分析。

这种先进的混合式光学/数字图案识别方法和技术已使光学系统中可以进行的运算大为发展。它们还推动了光学图案识别向着实用和现实的图案识别应用的方向发展。