Computer Vision

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Chapter 1

Methodology

Computer Graphics, from image to model. 机器视觉，需要猜测，包括理解、意义。

Computer Vision, from model(modeling, simulation) to image, 计算机图形学，不需要猜测。

1.1 Introduction

寒武纪物种爆发，因为眼睛的出现 computer vision begins with Larry Robert,1963. the edges define the shape, 1966 mit AI group established. David Marr book < vision > 视觉是简单的形状开始的，视觉是分层的视觉识别模型：1）Generalized Cylinder 简单物体组成 Brooks 1979; 2）Pictorial Structure, 基础元素之间用弹簧连接。语义分割：Normalized Cut，shi 1997 viola jones face detector detection ，pascal imagenet，sigmoid 换成 relu，使得 2012 比赛冠军，和 LeCun1998 年的手写数字没有太大区别

1.2 Others

1.2.1 图片分类

最近邻算法：L1 distance , 曼哈顿距离，

$$d_1 = \sum |I_1^i - I_2^i| \tag{1.1}$$

特点：每一个测试图片的计算时间是恒定的；Flann 是实例库 L2 distance，l1 距离的平方根 K nearest neighbor，k 是超参数 train data 分子集比较超参数，cross-validation 线性分类器，需要识别纹理，对无纹理的识别困难 the threshold at zero

(max(0,-)

) function is often called the **hinge loss**.

$L_i = \sum_{j \neq y_i} \max(0, s_j - s_{y_i} + \Delta)$

初始 w 为 0 时，损失等于类数量-1 **regularization loss**

$$L = \underbrace{\frac{1}{N} \sum_i L_i}_{\text{data loss}} + \underbrace{\lambda R(W)}_{\text{regularization loss}} \tag{1.2}$$

$$L = \frac{1}{N} \sum_i \sum_{j \neq y_i} [\max(0, f(x_i; W)_j - f(x_i; W)_{y_i} + \Delta)] + \lambda \sum_k \sum_l W_{k,l}^2 \tag{1.3}$$

weight regularization: L2:$\sum W^2$

L1:$\sum |W|$

elastic net $\sum \alpha W^2 + |W|$ max norm regularization dropout

Chapter 2

Computer Graphics

表 2.1: Usage of Computer Graphics

Name	Notes
Video games	全局光照，越亮游戏画面越好
movies	特效。远离现实的较容易。日常见的想要特效看得真实较为困难
animations	zootopia 中的动物头发。
Design	Autodesk.Ikea, render
Visualization	science, engineering, medicine, journalism, etc.
VR, AR.	
Digital Illustration.	
Simulation	dust bowl, black hole.
Graphical User Interfaces.	
Topography.	The quick brown fox jumps over the lazy dog.

physics of lighting and shading

representing and operating shapes in 3D.

2.1 Rasterization

Project geometry primitives(3D triangles or polygons) into fragments(pixels).

2.2 Curves and Meshes

2.3 Ray Tracing

Shoot rays from the camera though each pixel.

2.4 Animation and Simulation