

2. 图像去畸变



可执行文件: code/build/undistorted

3. 双目视差使用



可执行文件: code/build/disparity

4. 矩阵微分

$$4. (1). \quad d(Ax)/dx \\ = A.$$

$$(2). \quad d(x^T Ax)/dx = (A + A^T)x.$$

(3). Let $\chi = [\chi_1, \chi_2, \dots, \chi_n]^T$ and $A = (a_{ij})_{n \times n}$.

$$\chi^T A \chi = \sum_{i=1}^n \sum_{k=1}^n (\chi_k a_{ik}) \chi_i$$

$$\text{and } i\text{th element of } A \chi \text{ is: } \sum_{k=1}^n (a_{ik} \chi_k) \cdot \chi_i = \sum_{k=1}^n (\chi_k a_{ik}) \chi_i$$

Then trace of $A \chi \chi^T$ means:

$$\begin{aligned} \text{tr}(A \chi \chi^T) &= \sum_{i=1}^n (A \chi \chi^T)_{ii} = \sum_{i=1}^n \sum_{k=1}^n (a_{ik} \chi_k) \chi_i = \sum_{i=1}^n \sum_{k=1}^n (\chi_k a_{ik}) \chi_i \\ &= \chi^T A \chi. \end{aligned}$$

5. 高斯牛顿法

```
dongqxia@DellMorty:/media/dongqxia/新加卷/SLAM/HW/HW4/code/build - - [14:43:20]
$ ./GN
total cost: 3.19575e+06
total cost: 376785
total cost: 35673.6
total cost: 2195.01
total cost: 174.853
total cost: 102.78
total cost: 101.937
total cost: 101.937
total cost: 101.937
cost: 101.937, last cost: 101.937
estimated abc = 0.890912, 2.1719, 0.943629
```

加入对 dx 的判断条件, 在没有大幅提升的情况下(认为陷入 local minimum 附近), break

```
Terminal
dongqxia@DellMorty:/media/dongqxia/新加卷/SLAM/HW/HW4/code - - - - [19:16:04]
$ cd build
dongqxia@DellMorty:/media/dongqxia/新加卷/SLAM/HW/HW4/code/build - - [19:16:06]
$ make
[ 33%] Built target undistorted
[ 66%] Built target disparity
Scanning dependencies of target GN
[ 83%] Building CXX object CMakeFiles/GN.dir/gaussnewton.cpp.o
[100%] Linking CXX executable GN
[100%] Built target GN
dongqxia@DellMorty:/media/dongqxia/新加卷/SLAM/HW/HW4/code/build - - [19:16:18]
$ ./GN
total cost: 3.19575e+06
total cost: 376785
total cost: 35673.6
total cost: 2195.01
total cost: 174.853
total cost: 102.78
Not much improvement. Stop here.
estimated abc = 0.892079, 2.16994, 0.944438
dongqxia@DellMorty:/media/dongqxia/新加卷/SLAM/HW/HW4/code/build - - [19:16:20]
$
```

可执行文件: code/build/GN