**卡方值：**

# 优化ceres/ceres.hpp：

**package：Ceres**

**lib：${CERES\_LIBRARIES}**

**namespace：ceres**

**struct CostFunctor{**

**...**

**template<typename T>**

**bool operator() (**

**const T \*x, T \*error**

**) const {...}**

**}**

|  |  |
| --- | --- |
| AutoDiffCostFunction<type\_functor, n\_out, n\_in...>(functor) | **自动微分代价函数** |
| Solve(options, \*problem, \*summary) | **启动**优化 |

|  |  |  |
| --- | --- | --- |
| Problem | | **最小二乘问题** |
| 方法 | AddResidualBlock(\*CostFunction, \*LossFunction, \*x) | **添加残差块** |
| SetManifold(double \*, Manifold) | **设置**参数约**束** |

|  |  |  |
| --- | --- | --- |
| Solver::Options | | **求解**配置 |
| **属性** | **bool** minimizer\_progress\_to\_stdout | **最小化标准**输出进度 |
| **LinearSolverType** linear\_solver\_type | 增量方程求解**方法** |

|  |  |  |
| --- | --- | --- |
| Solver::Summary | | **求解**汇总 |
| 方法 | BriefReport / FullReport() | 信息 |

# 图优化g2o：

**package：G2O**

**lib：详见FindG2O.cmake**

**namespace：g2o**

**bin：g2o\_viewer \*.g2o**

## 内核core：

### 边base\_edge.h：

|  |  |  |
| --- | --- | --- |
| BaseEdge<dims, mea\_type> | | **边 (因变量，自动求导)** |
| BaseUnaryEdge<dims, mea\_type, vex\_type> | | **一元边** (base\_unary\_edge.h) |
| BaseBinaryEdge<dims, mea\_type, vex1\_type, vex2\_type> | | **二元边** (base\_binary\_edge.h) |
| BaseMultiEdge<dims, mea\_type> | | **多元边** (base\_multi\_edge.h) |
| 属性 | \_error | **误差向量** |
| \_measurement | **测量信息** |
| \_vertices | **顶点向量** |
| \_jacobianOplusXi | **雅可比矩阵** |
| chi2() | **卡方值** |
| dimension() | **维度** |
| 抽象 | **bool** read(&is) | **加载** |
| **bool** write(&os) | **保存** |
| computeError() | **设置误差** |
| 虚拟 | linearizeOplus() | **设置雅可比矩阵 (非必须)** |
| 设置 | setId(i) | **序号** |
| setVertex(i, vertex) | **连接顶点** |
| setMeasurement(y) | **测量信息** |
| setInformation(eye) | **信息矩阵 [dims, dims]** |
| setLevel(x) | **分层优化层级** |
| setRobustKernel(\*k) | **鲁棒核** |
| setUserData(\*anything) | **自定义数据** |

### 顶点base\_vertex.h：

|  |  |  |
| --- | --- | --- |
| BaseVertex<dims, type> | | **顶点** (自变量) |
| **属性** | \_estimate | **估计值** (通过 estimate() 访问) |
| **抽象** | **bool** read(&is) | **加载** |
| **bool** write(&os) | **保存** |
| setToOriginImpl() | **重置估计值** |
| oplusImpl(\*update) | **累加估计值** |
| **设置** | setMarginalized(true) | **待边缘化** |
| setFixed(true) | **定值** |
| setEstimate(et) | **估计值** |

### 求解block\_solver.h：

|  |  |
| --- | --- |
| BlockSolverPL<p, l>(linear\_solver) | **分块求解器** |

### 优化optimization\_algorithm\_\*.h：

|  |  |
| --- | --- |
| OptimizationAlgorithmGaussNewton(solver) | **高斯牛顿法** (optimization\_algorithm\_gauss\_newton.h) |
| OptimizationAlgorithmLevenberg(solver) | **LM算法** (optimization\_algorithm\_levenberg.h) |

### 鲁棒核robust\_kernel\_impl.h：

可共享，与卡方值有关

|  |  |  |
| --- | --- | --- |
| RobustKernelHuber | | **Huber核** |
| 属性 | setDelta(x) | **误差值标准差** (用于异常值标记) |

### 图模型sparse\_optimizer.h：

|  |  |  |
| --- | --- | --- |
| SparseOptimizer | | **稀疏图** |
| 属性 | edges() | **边** |
| vertex(i) | **顶点** |
| 设置 | setAlgorithm(algo) | **优化算法** |
| setVerbose(bool) | **输出信息** |
| setForceStopFlag(bool\*) | **停止信号** |
| addVertex(vex) | **添加顶点** |
| addEdge(edge) | **添加边** |
| 类型 | ::VertexIDMap | **顶点字典** |
| ::Edge / ::Vertex | 基类 |
| 启动 | **bool** initializeOptimization(level) | **初始化模型** |
| **int** optimize(iter) | **启动优化** |

## 求解solvers：

|  |  |
| --- | --- |
| type\_mat = BlockSolver::PoseMatrixType | |
| LinearSolverDense<type\_mat> | **稠密线性求解器 (**dense/linear\_solver\_dense.h**)** |
| LinearSolverEigen<type\_mat> | **Cholesky线性求解器 (**eigen/linear\_solver\_eigen.h**)** |

## 通用stuff：

### 运算misc：

|  |  |
| --- | --- |
| make\_unique<type>(...) | 初始化**类，返回**堆区指针 **(自动释放)** |

## 类型types：

### sba/types\_sba.h：

|  |  |  |
| --- | --- | --- |
| **顶点** | VertexSE3Expmap | **SE3Quat** |
| **边** | EdgeStereoSE3ProjectXYZ | **VertexPointXYZ** - VertexSE3Expmap |
| EdgeStereoSE3ProjectXYZOnlyPose | VertexSE3Expmap |

### slam3d/types\_slam3d.h：

|  |  |  |
| --- | --- | --- |
| **顶点** | VertexSE3 | **Isometry3** |
| VertexPointXYZ | **Vector3** |
| **边** | EdgePointXYZ | **VertexPointXYZ - VertexPointXYZ** |
| EdgeSE3 | VertexSE3 - VertexSE3 |
| EdgeSE3PointXYZ | VertexSE3 - **VertexPointXYZ** |
| EdgeSE3PointXYZDisparity | VertexSE3 - **VertexPointXYZ** |
| EdgeSE3PointXYZDepth | VertexSE3 - **VertexPointXYZ** |

|  |  |  |
| --- | --- | --- |
| SE3Quat(rota, pos) | | **实例化特殊欧氏群** |
| **属性** | matrix / matrix3x4() | **变换矩阵** |
| rotation() | **旋转四元数** |
| translation() | **平移向量** |
| **运算** | \* x | 矩阵乘法 |
| map(x) | 点变换 |
| **函数** | log() / ::exp(vec) | **李代数 ↔ 李群** |
| ::hat(vec) / ::vee(mat) | **反对称矩阵 ↔ 向量** |
| inverse() | **求逆** |
| **构造** | toVector() / fromVector(v) | **向量转换** |