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April Tag Odometry Relocalization

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kGoel647 committed 20 hours ago

1 parent 3c06b4c commit b65b3a0

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46 src/y2024/cpp/subsystems/drivetrain.cc

```
185     readings.pose.bearing = units::degree_t(gyro_.GetYaw()) + bearing_offset_;
186     readings.angular_velocity = units::degrees_per_second_t(gyro_.GetRate());
187
```

```
185     readings.pose.bearing = units::degree_t(gyro_.GetYaw()) + bearing_offset_;
186     readings.angular_velocity = units::degrees_per_second_t(gyro_.GetRate());
187
188 +   // April Tag Information Receiving
189 +   units::second_t receivedAprilTagFrameTime = units::second_t(
190 +       aprilTag_table->GetEntry("aprilTagFrameTime").GetDouble(-1.0));
191 +   if (receivedAprilTagFrameTime!= aprilTagFrameTime){
192 +     poseAtFrameCapture=odometry_.pose();
193 +     aprilTagFrameTime=receivedAprilTagFrameTime;
194 +     updatedTagPos=false;
195 +   }
196 +   bool processedFrame = aprilTag_table->GetEntry("processedFrame").GetBoolean(false);
```

```
+   frc846::Vector2D<units::foot_t> robotPoint;
+   robotPoint.x =
+       units::foot_t(aprilTag_table->GetEntry("robotX").GetDouble(-1.0)) +
+       5.25_in;
+   robotPoint.y =
+       units::foot_t(aprilTag_table->GetEntry("robotY").GetDouble(-1.0)) - 8_in;
+   units::foot_t tagDistance=robotPoint.Magnitude();
+   auto aprilTagX =
+       units::foot_t(aprilTag_table->GetEntry("aprilTagX").GetDouble(-1.0));
+   auto aprilTagY =
+       units::foot_t(aprilTag_table->GetEntry("aprilTagY").GetDouble(-1.0));
+   double aprilTagConfidence =
+       aprilTag_table->GetEntry("aprilTagConfidence").GetDouble(0.0);
+   auto aprilTagID = aprilTag_table->GetEntry("aprilTagID").GetDouble(-1.0);
+
+   // April Tag Pose Calculations, etc.
+   if (aprilTagConfidence != 0) {
+     robotPoint = robotPoint.Rotate(readings.pose.bearing);
+     robotPoint.x = robotPoint.x - aprilTagX;
+     robotPoint.y = robotPoint.y - aprilTagY;
+   }
+
+
    auto pitch_initial = units::degree_t(gyro_.GetPitch());
    auto roll_initial = units::degree_t(gyro_.GetRoll());
    auto tilt =

    readings.velocity = unfiltered_velocity;

+   double aprilTagFactor=-1.0;
+   if (!updatedTagPos){
+     units::degree_t angleToTag = units::math::atan2(aprilTagY-robotPoint.y, aprilTagX-robotPoint.x);
```

```
                                                                    +     aprilTagFactor = aprilTagConfidence * confidence_factor.value() *
                                                                    +                      (1 - (readings.velocity.Magnitude()/max_speed_.value())) *
                                                                    +                      velocity_factor.value() * (1/(tagDistance.to<double>()))*distance_factor.value() * (90_deg-units::math::abs(readings.pose.bearing-angleToTag)).to<double>()*angle_offset_factor.value();
                                                                    +
                                                                    +     frc846::Vector2D<units::foot_t> point;
                                                                    +     point.x = (((poseAtFrameCapture.point.x + aprilTagFactor * robotPoint.x) / (1 + aprilTagFactor)) + odometry_.pose().point.x-poseAtFrameCapture.point.x);
                                                                    +     point.y = (((poseAtFrameCapture.point.y + aprilTagFactor * robotPoint.y) / (1 + aprilTagFactor))+ odometry_.pose().point.y-poseAtFrameCapture.point.y);
                                                                    +     odometry_.SetPoint(point);
                                                                    +     updatedTagPos=true;
                                                                    +   }
                                                                    +
235  pose_x_graph_.Graph(odometry_.pose().point.x);                 235  pose_x_graph_.Graph(odometry_.pose().point.x);
236  pose_y_graph_.Graph(odometry_.pose().point.y);                 236  pose_y_graph_.Graph(odometry_.pose().point.y);
237  pose_bearing_graph.Graph(odometry_.pose().bearing);            237  pose_bearing_graph.Graph(odometry_.pose().bearing);
```

12 ■■■■■ src/y2024/include/subsystems/drivetrain.h

```
159    bool VerifyHardware() override;                             159    bool VerifyHardware() override;
160                                                                160
161   private:                                                     161   private:
                                                                   162   //April Tag
                                                                   163   units::second_t aprilTagFrameTime;
                                                                   164   frc846::Position poseAtFrameCapture;
                                                                   165   bool updatedTagPos=false;
```

```
                                                    +   frc846::Loggable
                                                    april_tags_loggable_{*this, "april_tags"};
                                                    +   frc846::Pref<double>
                                                    confidence_factor{april_tags_loggable_,
                                                    "april_confidence_factor",1.0};
                                                    +   frc846::Pref<double>
                                                    velocity_factor{april_tags_loggable_,
                                                    "april_velocity_factor", 1.0};
                                                    +   frc846::Pref<double>
                                                    distance_factor{april_tags_loggable_,
                                                    "april_distance_factor", 1.0};
                                                    +   frc846::Pref<double>
                                                    angle_offset_factor{april_tags_loggable_,
                                                    "april_angle_factor", 1.0};
                                                    +
                                                    +    std::shared_ptr<nt::NetworkTable>
                                                    aprilTag_table =
                                                    +
                                                    nt::NetworkTableInstance::GetDefault().Get
                                                    Table("AprilTags");
    // Drivetrain dimensions.                       // Drivetrain dimensions.
    frc846::Pref<units::inch_t>                     frc846::Pref<units::inch_t>
width_{*this, "width", 21.75_in};                   width_{*this, "width", 21.75_in};
    frc846::Pref<units::inch_t>                     frc846::Pref<units::inch_t>
height_{*this, "height", 26.75_in};                 height_{*this, "height", 26.75_in};
```

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