Evaluation for Different Test Parameters

Rama krishna Reddy Dyava

November 1, 2017

Figure 1: The Universe

- Compare V_{min} and V_{max}.
- Compare MIMO controller and PD controller.
- Compare Maximum load and Minimum load.
- Compare with friction observer and without observer.

1 Velocity maximum and Velocity minimum

The evaluation of velocity is conducted between maximum 100% and minimum 10% velocity for the parameters of MIMO controller, 100% load and with friction observer. The difference between the each test is explained in detail in below sections.

1.1 Pose accuracy and pose repeatability

With the V_{min} the pose **P5** has worst position accuracy AP and only pose **P5** has better orientation accuracy ($AP_{a,b,c}$) when comparing with V_{max} test parameters. The V_{max} has better test results in all Poses for pose accuracy.
For the V_{min}, same thing is repeated in Pose repeatability , where the pose **P5** has worst position repeatability RP even for orientation it is bad, except pose **P1** when compare to V_{max}.
However, for the pose **P1**, the pose repeatability is good than V_{max}, significantly the pose **P5** is importantly consider and other poses are not considerable changes between V_{min} and V_{max}.

1.2 Multi-directional pose accuracy variation

At the V_{max}, the performance is much better than V_{min} test. The test with V_{max} is recommended.

1.3 Distance accuracy and repeatability

The V_{min} shows better distance pose accuracy and repeatability than V_{max} and for the orientation accuracy and repeatability is almost the same for both V_{min} and V_{max} tests.

1.4 Position stabilisation time

The V_{min} stabilisation time and over shoot is almost zero, where the V_{max} has considerable values.

1.5 Path characteristics

The V_{max} Path accuracy and orientation test values are not good when compare to V_{min} test and similarly for Path repeatability is same. But the V_{max} Orientations repeatability ($RP_{a,b,c}$) have better values than V_{min} test.

1.6 Path characteristics at Re-orientation

The V_{min} shows effective results than V_{max} test in all values, except RT_c. Hence the V_{min} is considerable.

1.7 Cornering deviations

The V_{min} has very good test values than V_{max} .

1.8 Path velocities

In this very important information is noticed, the Path velocity accuracy AV and the Path velocity repeatability in V_{min} much worse than V_{max} test. However, the opposite for the the Path velocity fluctuation.

2 MIMO controller and PD controller

The evaluation of controllers is conducted between MIMO controller and PD controller for the parameters 100% velocity, 100% load and with friction observer. The difference between the each test is explained in detail in the below sections

2.1 Pose accuracy and pose repeatability

Except the for the pose **P1, P3** the MIMO controller has better than PD. Although, the difference is negligible values for pose accuracy. But the **PD** pose repeatability is very bad values than **MIMO**.
Hence, the MIMO is better in this test.

2.2 Multi-directional pose accuracy variation

The **MIMO** shows similar values with respect to **PD** test. The orientational deviations are little bit better in the **MIMO**.

2.3 Distance accuracy and repeatability

The **PD** shows better performance for accuracy and repeatability orientations (only in a and c directions), the postion distance acuracy is also better with **PD** controller than the **MIMO**. Where the opposite for distance repeatability (i.e. the MIMO is good).

2.4 Position stabilisation time

The **PD** stabilisation time and over shoot is much higher than **MIMO**. Hence, the **MIMO** is preferable.

2.5 Path characteristics

The **PD** is much better values and less deviations than the **MIMO**. Hence, the **PD** is preferable.

2.6 Path characteristics at Re-orientation

The **PD** is much better values fro all path accuracy parameters and vice-versa for all the repeatability parameters when compare to the **MIMO**. So, mixed results in this test.

2.7 Cornering deviations

The **MIMO** has worst values when compare to the **PD** controller. **PD** controller is good.

2.8 Path velocities

In this very important information is noticed, the Path velocity accuracy AV , the Path velocity repeatability and the Path velocity fluctuation is much better values in the **MIMO** controller.The **MIMO** controller usable here.

3 Minimum mass and Maximum mass

The evaluation of Mass is conducted between minimum mass M_{min} and the maximum mass M_{max} for the parameters 100% velocity, MIMO controller and with friction observer. The difference between the each test is explained in detail in the below sections

3.1 Pose accuracy and pose repeatability

In the pose accuracy the values are similar for both M_{min} and M_{max}, however the M_{min} is little bit better values than M_{max}, but these variations are negligible. The M_{max} repeatability pose accuracy is better than M_{min} repeatability accuracy, but the repeatability orientation has mixed results. Hence, the M_{min} and M_{max} are the same for good evaluation.

3.2 Multi-directional pose accuracy variation

The M_{min} shows similar values with respect to M_{max} test. The orientations are little bit better in the M_{max}.

3.3 Distance accuracy and repeatability

Except the distance pose repeatability, the M_{min} shows the better performance for all values than the M_{max}.

3.4 Position stabilisation time

The M_{min} stabilisation time and over shoot is much higher (i.e worse) than M_{max}. Hence,the values are better for the M_{max}.

3.5 Path characteristics

The M_{min} is much better values and less deviations than the M_{max} only for the path accuracy, excatly opposite is true for path repeatability parameters.

3.6 Path characteristics at Re-orientation

This test is similar to the above test, the M_{min} shows good perforamnce (i.e less deviations)M_{min} is much better values and less deviations than the M_{max} only for the path accuracy, excatly opposite is true fro path repeatability parameters.

3.7 Cornering deviations

The M_{max} has worst CO (overshoot)values when compare to the M_{min} and opposite is tru for CR.

3.8 Path velocities

Except the Path velocity repeatability, the M_{min} shows good performance (i.e less deviations) than theM_{max}.

4 With friction observer and Without friction observer

The evaluation of friction observe is conducted between With friction observer and Without friction observer for the parameters of 100% velocity, MIMO controller and the maximum mass M_{max}. The difference between the each test is explained in detail in the below sections

4.1 Pose accuracy and pose repeatability

Except the pose accuracy of the poses **P1,P5** all the values are have much deviations without friction observer deviations (**WOFO**) when compare to the with friction observer (**WFO**). Hence, the (**WFO**) is preferable.

4.2 Multi-directional pose accuracy variation

The deviations without friction observer (**WOFO**) are higher when compare to the with friction observer (**WFO**). Hence the test with friction observer (**WFO**) is consider.

4.3 Distance accuracy and repeatability

The deviations without friction observer (**WOFO**) are higher when compare to the with friction observer (**WFO**). Hence the test with friction observer (**WFO**) is consider.

4.4 Position stabilisation time

The (**WOFO**) overshoot is very less deviation than the (**WFO**) and the stabilisation time is taken more in the (**WOFO**) than the (**WFO**). Hence, we have mixed results.

4.5 Path characteristics

The deviations without friction observer (**WOFO**) are higher when compare to the with friction observer (**WFO**). Hence the test with friction observer (**WFO**) is consider.

4.6 Path characteristics at Re-orientation

The deviations without friction observer (**WOFO**) are higher when compare to the with friction observer (**WFO**). Hence the test with friction observer (**WFO**) is consider. Importantly, the path accuracy deviation is much bigger than all of them.

4.7 Cornering deviations

The (**WFO**) has worst CO (overshoot) values when compare to the (**WOFO**) and round-off error value (CR) has much deviation in the (**WOFO**).

4.8 Path velocities

The (**WOFO**) path velocity repeatability is much higher (i.e. deviation) than (**WFO**). But for the path velocity accuracy and path fluctuation are similar for the both types. Hence, agian we have mixed results.