Friction System Simulation on Electro-Mechanic Systems

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ABSTRACT

In the present study identified friction using a single test were examined. Identify friction Using GMS, which includes four diagrams are friction regime and the stimulation signal has an important role to identify the individual tests. The simulation results showed that electromechanical systems using MATLAB software can be used to reduce friction and damage caused by the friction is somewhat less.

Key words: friction, electromechanical systems, identify friction, the GMS,

1. Introduction

Computer simulation, are useful for many natural systems in physics, chemistry and biology, and human systems in economics and social sciences (sociology computer) as well as in engineering to gain insight into the operation of those systems [1]. Computer simulations are often used in order to be safe to humans loop simulations [2]. Traditionally, the formal modeling of systems has been via a mathematical model, which attempts to find analytical solutions to problems that predict the behavior of the system using a series of parameters and initial conditions is possible [4]. Thus, by simulation may be several years from the consideration of a system in a few seconds. As a result, several projects of Yksystem reviewer able to study in a short time and compare their performance results for having the power to extend the time [3]. By collecting data needed in the simulation program, is able to evaluate changes in real-time details are not visible, he said. In other words, changes those are not visible or study due to the high speed of development in the real system, this method of control and review [5]. This is done with the help of the model. This essential requirement is that all phenomena depend on your situation to start testing the system are exactly preserved. This is possible only in simulation. The simulation allows the analyst that a test or review by maintaining all initial conditions and the behavior of the system by a program again. In each of the repetitions, the values of some parameters in order to obtain their effect on system behavior and the results will change. Simulation able to check the new changes in the existing systems and the systems that are at the design stage and still no facilities, capital and time to progression or development of not only physical. In addition, testing assumptions that might create and study their systems by other methods is impossible or dangerous to this approach is feasible. But the disadvantages of simulation can be used such as:

Establish and develop a good model simulation is often expensive and requires time and need a lot of information that may not be readily available [6,7]. Shannon Fazstv quotes in his book suggests that the company may be planning to develop a model of good wishes from 3 to 10 years. Simulation can position itself as the real world to accurately show, while really does not do this [8]. There are several problems inherent in the simulation, which if not solved properly can lead to wrong results. The simulation is not accurate and can measure the degree of carelessness. Sensitivity analysis to changes parameter solves only part of the problem. Consultants for numerical simulation results and with any number of decimal places the experimenter chooses, as a result of certain risk large numbers, giving too much credibility to the numbers follows. Finally although simulation is very valuable and useful method to solve problems but certainly is not a panacea for all management problems. Still largely development and use of simulation models is that science rather than art. So, like other arts fan to a large extent, the success or failure determining factor, but does not specify how it is used.

2- Case Study Model

Block diagram model designed to simulate friction in friction modeling and control of electromechanical systems is presented in Fig.1 As can be seen entries include pressure system over time, speed, speed in terms of RPM input, and the input torque in Newton meters. Inputs to the system are using the blocks lookup should be noted that the type of offering to arrange a time that is controlled by the Clock block.

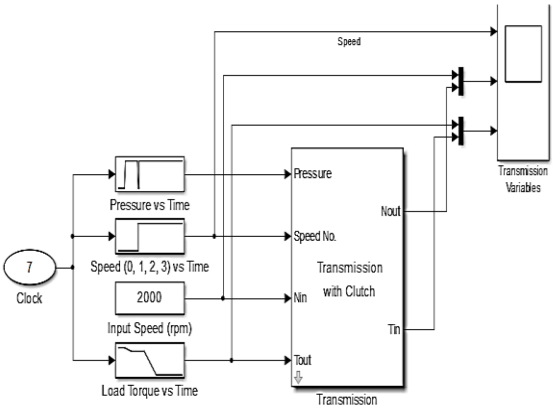


Fig.1.Overall system block diagram simulation of friction

Velocity, pressure, speed and torque input is provided in the table should be noted that these amounts are based on time simulation system are provided.

Table1: Simulation input parameters

[0,1,1.1,3,3.1,3.2,3.3,10]	**Input vector**	**Pressure**
[0,0,1,1,0,0,1,1]	**Input data**	
[0,3.1,3.11,10]	**Input vector**	**speed**
[1,1,2,2]	**Input data**	
2000		**Input speed**
[0,1,2,4,6,10]	**Input vector**	**Torque**
[0,0,-500,-500,-4000,-4000]	**Input data**	

Incoming data continue to come in below the Transmission System, the system includes a subsystem calculate the friction force Coulomb Transmission Subsystem speed changes according to the applied load and eventually output subsystem is inertia. The structure of each of these subsystems is provided in the following.

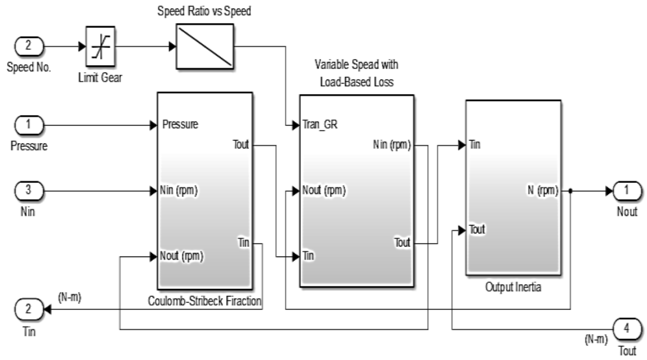


Fig.2.system friction diagram

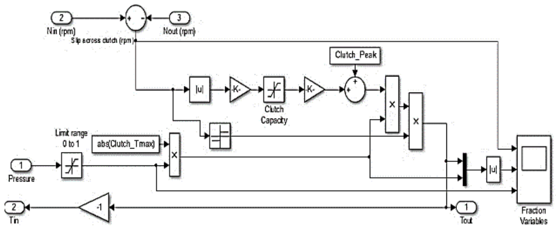


Fig.3. Transmission system diagram

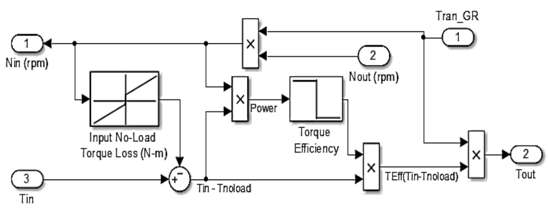


Fig.4. Coulomb friction force algorithm

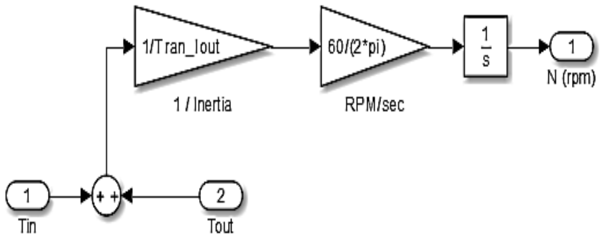
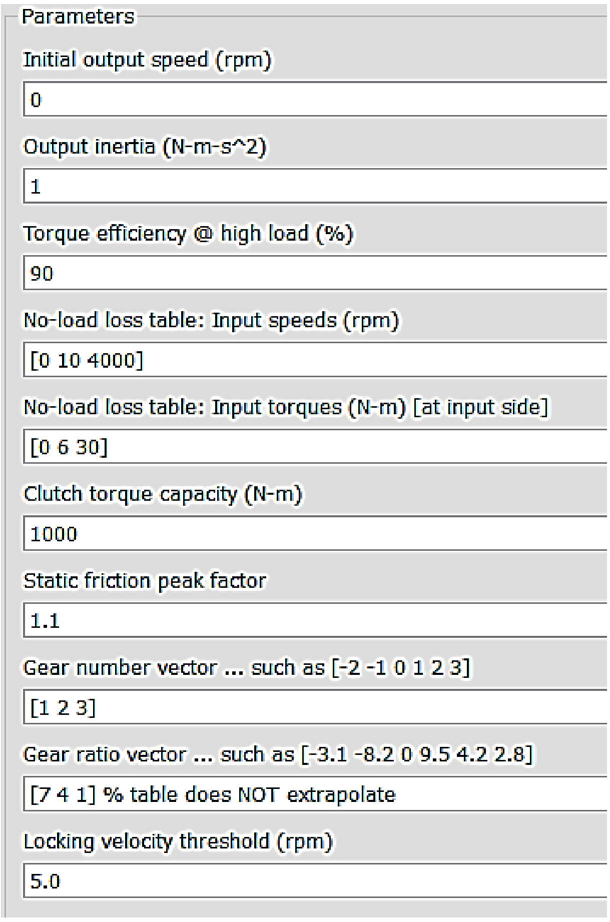


Fig.5.output RPM via applied load



Parameters

Initial output speed (rpm)

0

Output inertia (N-m-s^2)

1

Torque efficiency @ high load (%)

90

No-load loss table: Input speeds (rpm)

[0 10 4000]

No-load loss table: Input torques (N-m) [at input side]

[0 6 30]

Clutch torque capacity (N-m)

1000

Static friction peak factor

1.1

Gear number vector ... such as [-2 -1 0 1 2 3]

[1 2 3]

Gear ratio vector ... such as [-3.1 -8.2 0 9.5 4.2 2.8]

[7 4 1] % table does NOT extrapolate

Locking velocity threshold (rpm)

5.0

Fig.6. simulation parameters in MATLAB

3- Parameters Simulation System

3-1-1 The first model

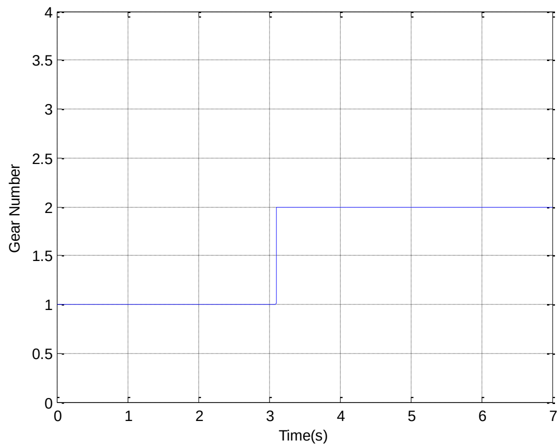


Fig.7.the effect of friction in the range of gear changes

Gear changes during simulation

The gear changes during the simulation shows electromechanical systems.

3-1-2 The second model

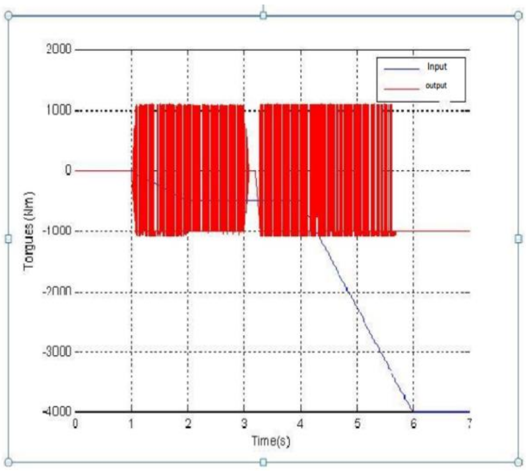


Fig.8. the effect of friction torque range

As it can be seen that the input torque is highlighted in blue in the first seconds of the second third of the torque that is sent red and the impact it between 1000 and 1000 and this range are widely variable returns and is continuous. It should be noted that when the input torque between 3.2 seconds and placed third sudden sharp drop in output torque range and it continues 3.4. Torque in 3.4 seconds to 5.5 seconds in Figure 8 after a sharp drop returned to normal range and maintains your domain. This shows that the gearshift is in the second third and the friction causes the electromechanical system is slow.

Third grade point average effect of friction in the range of speed

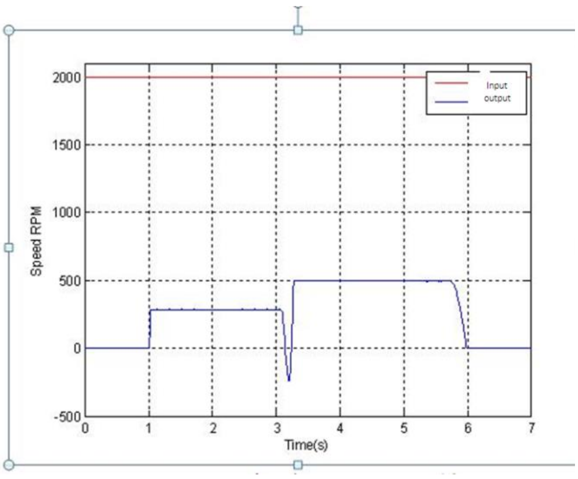


Fig.9. Input speed (reference) and output speed

In Figure 9, the input and output speed is based on the value of the input is fixed at about 2000 PRM. For the output values in the first second start moving charts and the lowest is 3.2, which indicates that the shift has been slow and friction. After a short time in 3.4 seconds and reaches its maximum And a sharp drop in second, 6 for shifting the other. This process until the ribs are changing the electromechanical system is evident.

3-2- The fourth model

The influence of friction than the relative speed range

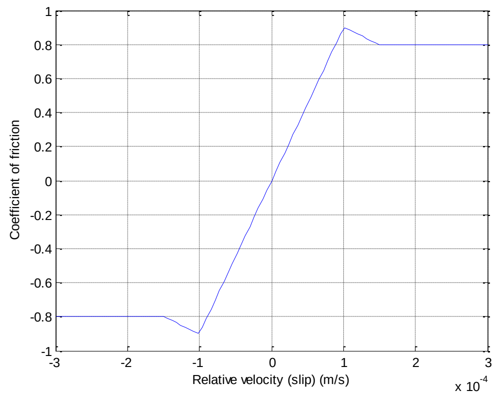


Fig.10. The relative speed and coefficient of friction

Conclusion

As can be seen in the relative speed range and lowest coefficient of friction in complete stop mode 1 and -0.6, respectively. After spending a short time at a speed of 1 meter per second coefficient of friction relative to its peak

Friction detected using a single test is possible to do, even for more complex models and nonlinear models is true. Identify friction Using GMS, which contains four graphical regime is based on friction. However, the choice of excitation signal using a single test to identify an important role to play. In this study, the friction was modeled and then declined in electromechanical systems and damages caused by friction was somewhat lower.

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