Chapter 6

Conclusions and Recommendations

6.1 Model Development

The model is used successfully in predicting the behavior of a vehicle during pure cornering and combined maneuvers. The model uses as few as 19 parameters to do linear operating range analysis. This attribute allows the model to be used in the very early stages of vehicle design when little is known about component definition. The modularity of the computer model creates the potential for the tire and suspension models to grow in complexity with design decisions and product definition. The system equations are in an easy to alter form and Chapter Three outlines the total equation development. The complexity of the system equations is significantly reduced by implementing the anti-features in a separate suspension model. Finally as demonstrated in this work, the model can be implemented on a personal computer with no unusual hardware or software. A well documented program listing is included in Appendix A.

Limitations of the model include the following points. As stated in Chapter Five, the solution technique does not converge for borderline solutions. Other limitations of the model that are less severe include: the exclusion of the static deflection of the system in the equations, which creates difficult to interpret results; relations that resulted in division by near-

zero for the pure tractive and pure braking case. Correction of these limitations is possible.

6.2 Recommendations for Further Development

The solution technique should be replaced with one more appropriate for cyclically nonlinear equations. Then, the non-linear tire could be used to develop and include limit handling analysis and tire saturation effects.

The static deflection of the suspension should be included in the equations so the vehicle deflections are zero under the influence of gravity. Gravity is necessary in this model to give the proper total vertical loading on the tires.

The equations should be altered so solutions for pure traction and pure braking will converge. This should take only minor changes.

The model should be run with different vehicle configurations and more comprehensive representations of the tire and suspension to assure total applicability.

6.3 Concluding Remarks

The motivation of this work is to devise a vehicle design analysis tool that could be implemented in the early stages of vehicle design; would be appealing to use in industry; and could be used in combined maneuver analysis. This motivation required

a rethinking of the way a vehicle model should be formatted so it would align with the design process. Provisions are made for use of existing tire and suspension models. In fact, the longevity of this tool through the suspension design depends on the existence and implementation of these models. Consequently, some version of a model of this type can remain applicable throughout most of suspension design process. The first steps to create this tool are taken in this work.