

## **CHAPTER III**

### **RESEARCH METHODOLOGY**

This chapter contains an explanation about the object of research and development of models to illustrate the system in preparation for planning. Stages of the research will also be described in the flow chart. All sub chapters will be explained as follows:

#### **3.1 Research Object**

Object of research in this study is a virtual factory in the form of a virtual conveyor used for assembly lines, virtual robot arm with 6 degrees of freedom, a virtual NC drilling, and a virtual box.

#### **3.2 Development System**

Several stages to make virtual manufacturing is:

##### **a. Developing Virtual Model**

This is an early stage in the development of virtual manufacturing, virtual model of conveyor, a virtual model of the robot arm, the virtual rack models and virtual model of Ncdrilling..

b. Developing Virtual Environment

Making virtual environment in purpose as the space placement for virtual models that have been built. Making virtual environments using 3D Truevision software. with the environment it will look more attractive.

c. Developing Control Algorithm

Making this algorithm aims to combine virtual models that have been made earlier to the virtual environment. The merger is intended for the virtual model can be run and can be controlling in software.

### **3.3 Requirement Data**

The requirement data to conduct this research is:

- a. The data model details.
- b. Position data of each object.
- c. Transfer data of moving object.
- d. Rotation data of moving object.

The data obtained from previous research, so in this study does not discuss how to obtain these data.

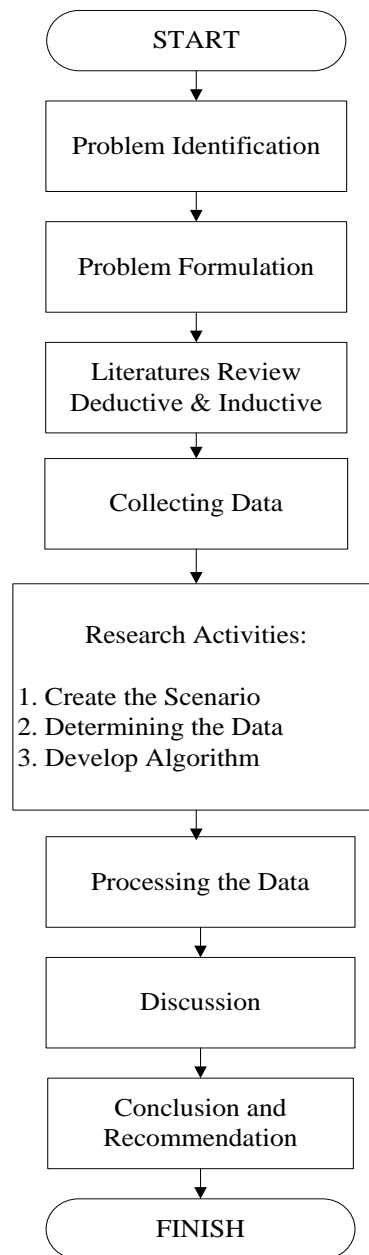
### **3.4 Data Analysis**

The data has been collected during the study and then analyzed so that it becomes meaningful. The process of data analysis going on since the data collected until the end of the study with the direction of research questions that are equipped with the data obtained..

### **3.5 Tool Analysis**

In this study, researchers used several tools to complete the study. Some tools that are Truevision and Visual Studio. Truevision is useful for creating a virtual 3d model commonly used to build a gaming application. While Visual Studio is a programming language used to build a software.

### 3.6 Research flow diagram



**Figure 3.1 Research Flowchart**

### **3.7 Problem Identification**

Problem identification is identifying the problem that appear in making virtual manufacturing which is focused on preparation of schedulling in production system. This process is done by direct observation.

### **3.8 Problem Formulation**

Explaining about the critical issues that arise in creating a virtual manufacturing model and the analysis that causes the problem.

### **3.9 Literature Review**

Discusses related research associated with this research. In this study focused more on virtual manufacturing, virtual environments, rapid prototyping, and robotics.

### **3.10 Research Architecture**

#### **2.10.1 Create Scenario**

Create a scenario of early stages in the manufacture of a VM. This section describes the VM development planning.

#### **2.10.2 Determining the Data**

Determining the data is the process whereby data generated in previous research will be in the process and offered guidance in the application of inverse kinematics.

### **2.10.3 Develop Algorithm**

This is the core stage in the research that is making the algorithm for controlling the robot movement and the movement of moving objects from one coordinate to another coordinate.

### **3.11 Processing the Data**

Data processing is performed using data from previous research conducted by Afrilia DR. Then the data is enforced into the functions contained in the Truevision 3D.

### **3.12 Discussing**

This section discusses the results of modeling that has been built which will then be the basis for decision making and recommendations for further research.

### **3.13 Conclusion and Recommendation**

This stage is the final step in this research which contains a summary of research and advanced suggestions for further research that is useful to develop research and provide recommendations necessary to complete the study.