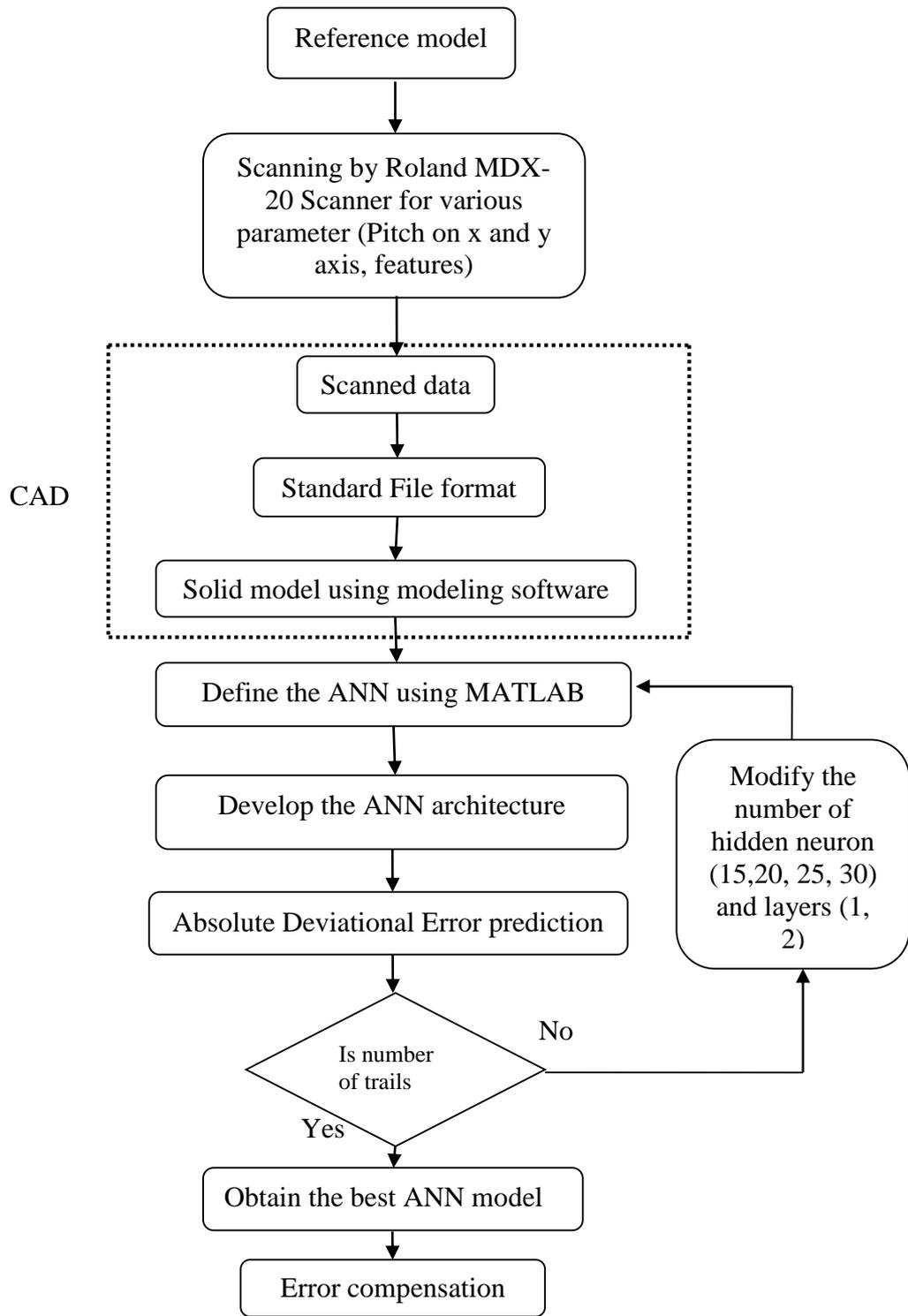# RESEARCH PROPOSAL

OPTIMIZATION OF PROCESS PARAMETER FOR ACCURACY IN REVERSE ENGINEERING

Scanning is one of the critical stages of the reverse engineering process, as it affects the accuracy of the part developed through it. Two types of scanning, contact and non-contact are used to scan the objects. Roland MDX-20 scanner is a less precision contact type scanner and so results in low accurate part. The error during the scanning stage is comparatively higher than the other stages, because of speed of scanning, complexity in the shape of the objects, etc., hence, the elimination or minimization of error during scanning would lead to get more accurate part. On this consideration, this thesis proposes a artificial intelligence based methodology (ANN) to predict the errors in terms of influencing scanning parameters with which could be used to modify the scanned model by error compensation. The main aim of this thesis is to enhance the capability of a contact type Roland MDX-20 scanner by improving its accuracy. The accuracy depends on mainly on scanning parameters of pitch on x-axis, pitch on y-axis and features and also modeling software. If the relationship between the scanning errors and various parameter settings could be established, then errors can be estimated and compared during the CAD model building process. This will reduce the inaccuracy resulted due to scanning and hence the product accuracy can be improved.

```
                    ┌─────────────────────┐
                    │   Reference model   │
                    └─────────────────────┘
                              │
                              ▼
              ┌───────────────────────────────────┐
              │   Scanning by Roland MDX-          │
              │   20 Scanner for various           │
              │   parameter (Pitch on x and y      │
              │   axis, features)                  │
              └───────────────────────────────────┘
                              │
         ┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ▼ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐
                    ┌─────────────────┐
         │          │  Scanned data   │                 │
                    └─────────────────┘
 CAD     │                  │                           │
                            ▼
         │       ┌──────────────────────┐               │
                 │  Standard File format │
         │       └──────────────────────┘               │
                            │
         │                  ▼                            │
            ┌──────────────────────────────────────┐
         │  │  Solid model using modeling software │    │
            └──────────────────────────────────────┘
         └ ─ ─ ─ ─ ─ ─ ─ ─ ─│─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘
                            ▼
          ┌──────────────────────────────────┐      ┌──────────────┐
          │   Define the ANN using MATLAB    │◄─────│
          └──────────────────────────────────┘      │
                            │                        │  Modify the
                            ▼                        │  number of
          ┌──────────────────────────────────┐      │  hidden neuron
          │   Develop the ANN architecture   │      │  (15,20, 25, 30)
          └──────────────────────────────────┘      │  and layers (1,
                            │                        │  2)
                            ▼                        └──────────────┘
          ┌──────────────────────────────────┐              ▲
          │ Absolute Deviational Error        │              │
          │ prediction                        │              │
          └──────────────────────────────────┘              │
                            │                                │
                            ▼         No                     │
                      ◇─────────────◇─────────────────────────
                     ╱ Is number    ╲
                     ╲ of trails     ╱
                      ◇─────────────◇
                Yes         │
                            ▼
          ┌──────────────────────────────────┐
          │     Obtain the best ANN model    │
          └──────────────────────────────────┘
                            │
                            ▼
          ┌──────────────────────────────────┐
          │       Error compensation         │
          └──────────────────────────────────┘
```

Proposed methodology