Fuzzy-Based
DECESION MAKING

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Computer-Based Learning & Training:

➢Several efforts have been made to develop computer-based learning and training systems. However, computer animation alone will not provide users with opportunities to obtain real-sense learning/training and develop their skills. For that reason, there is a need to explore more advanced technologies to improve learning and training. Virtual reality has found a number of applications in learning and skills training.

➢Real educational processes deal with uncertainty in human knowledge. Most of available educational systems use classical methods to handle vague information in the knowledge representation and decision making. Furthermore, fuzzy set theory incorporates precise techniques for solving such problems. Fuzzy logic concepts have been used in ESs for knowledge representation and reasoning.

➢Fuzzy logic is the most suitable tool to deal with vague knowledge and the process of decision making in the educational system.

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Fuzzy Set Theory and Virtual Reality Systems:

One of the most important requirements that precede the design of the educational system is to adopt suitable methods for knowledge acquisition and real-time modeling of the actual world.

Human thinking and reasoning involve vague information, therefore, educational systems should be able to cope with such vagueness. The vagueness is related to the following source:

- Information provided by the learner.

- The current knowledge level of the learner.

- The evaluation of the leaner level.

- The experience of the instructor.

- The objective behind the course materials.

➢ The sequence of the educational events that is based on the instructor's experience is the core of such educational systems. Therefore, it is important to model the experience of the instructor in such away that the educational system should be flexible, easy, and at the same time enables the learner to deal with the course materials which are suitable to his knowledge level.

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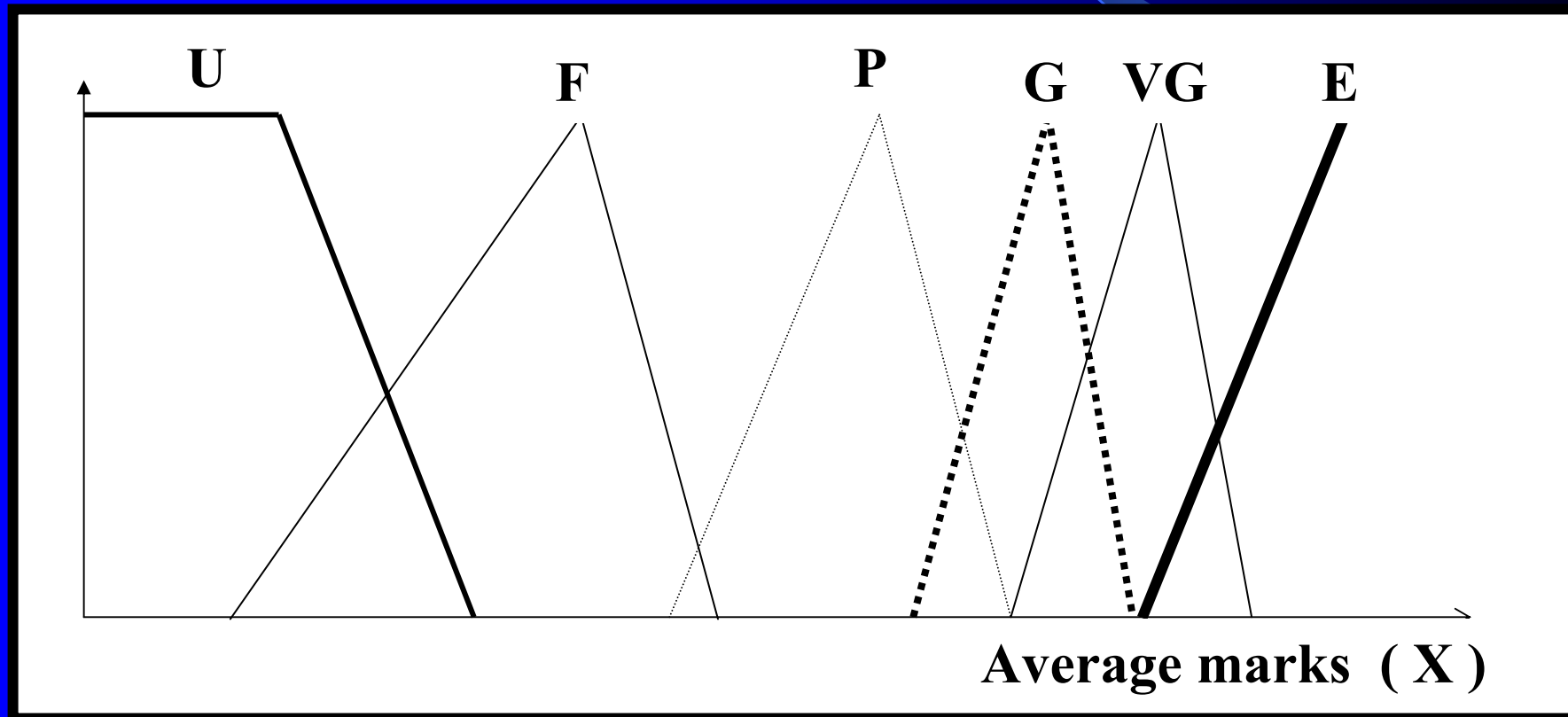
In computer-based educational system, the fuzzy set theory concepts can be used for solving problems related to the:

- Modeling of the learner.

- Modeling of the instructor experience.

- Learner knowledge level identification during each educational unit.

- Modeling of real world environments.

- Algorithms for on-line 3-D graphic generation.

- Algorithms for creating virtual environments.

- - Real-time control of the changing virtual reality.

- Decision making for learning path selection.

- Overall evaluation of the learner.

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Decision Making Process:
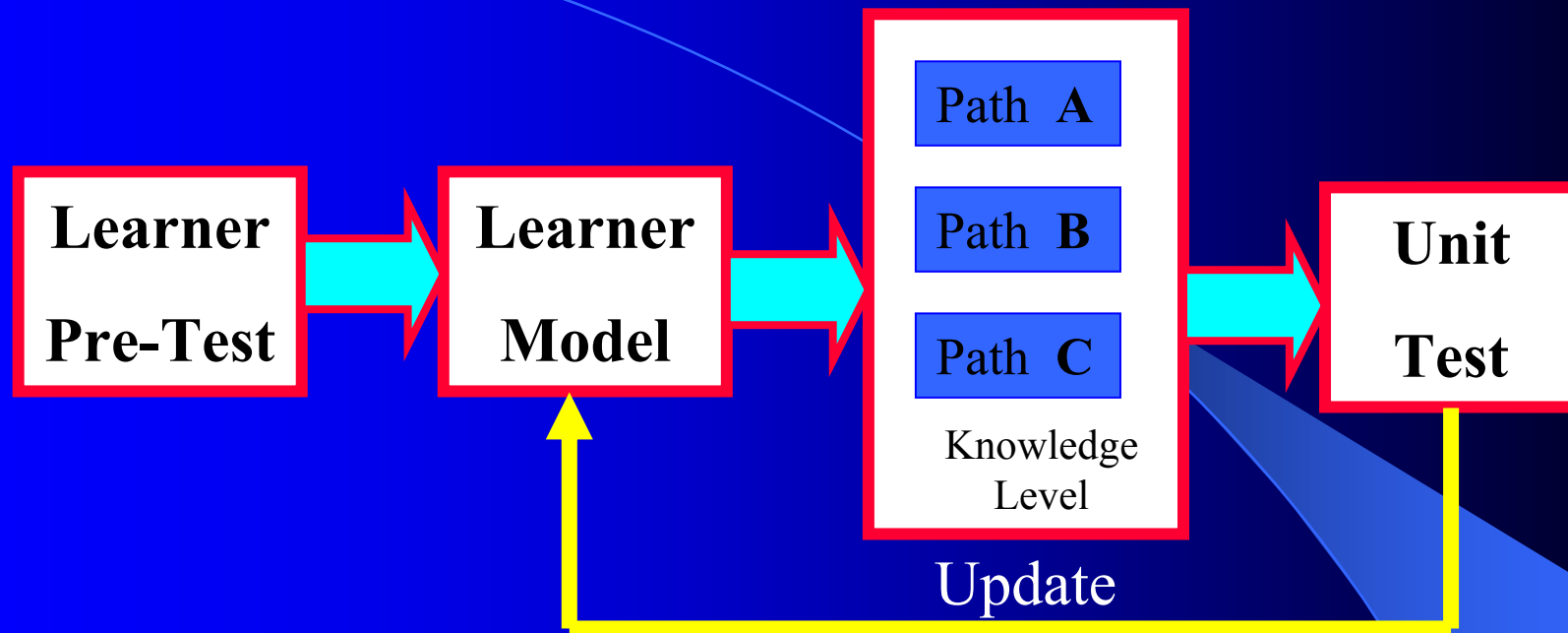
Learning path (A); includes a summary of the educational unit, which is quite enough for high quality learners.
- **Learning path (B);** includes the usual information as that given by the instructor for normal learners.
Learning path (C); includes a detailed information that facilitates the learning process for beginners.

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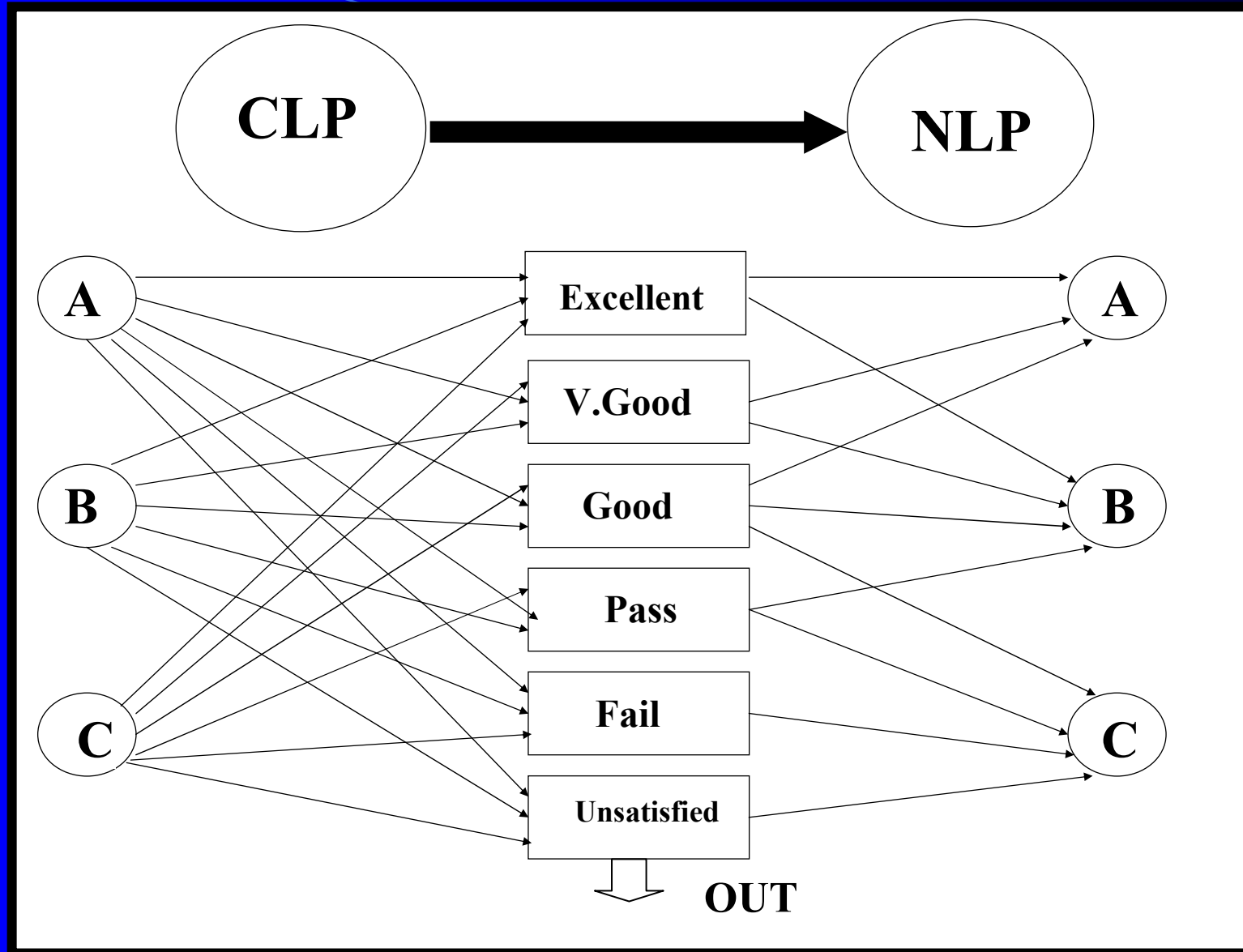
A set of fuzzy rules that combine the current learning path and test result as shown in the rule table. In general, a rule is an implication statement expressing the learning level, test result and learning path in the next educational unit. For example, the rule;

IF CLB AND TVG THEN NLA

This means that if the current learning path (CL) is path (B) and the test (T) is very good (VG) then the next learning path (NL) is path (A). In this system 18 rules have been used to specify the decision making process.

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The rules table for Decision Making:

C: Current   T: Test   N: Next   L: Learning Path

(*):   Stay in the same unit.

	CLA	CLB	CLC
TE	NLA	NLA	NLB
TVG	NLA	NLA	NLB
TG	NLA	NLB	NLC
TP	NLB	NLC	NLC
TF	NLB*	NLC*	NLC*
TU	NLC*	NLC*	OUT

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Conclusions:

➢ This work addressed the importance of using virtual reality technology and fuzzy set theory principles in learning and skills training.

➢ Course material can be integrated with on-line display through virtual environments.

➢ Modeling and decision-making based on fuzzy logic effectively contribute in dealing with vague information. The decision making process in this system is taken place according to the actual knowledge level of the learner.

➢ Future trends in education will use fuzzy set theory and virtual reality technology to support every type of educational program. The virtual reality system provides a powerful education tool that can assist users in learning and training through a computer system and some special devices.

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