Distributed Intuitionistic Fuzzy ω-Finite State Automata

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Abstract: In this paper the notion of distributed intuitionistic fuzzy ω-finite state automata is introduced with different modes of acceptance along with different acceptance criteria.

Keywords and Phrases: Intuitionistic Fuzzy ω-Automata, Distributed Intuitionistic Fuzzy ω-Automata.

I. INTRODUCTION
An ω-language is a collection of infinite strings over a finite alphabet, an ω-machine is any device capable of processing these input strings. The notion of intuitionistic fuzzy ω-automata has been introduced in [8]. In section 2 some elementary and preliminary definitions are discussed. In section 3 distributed intuitionistic fuzzy ω-finite state automata is introduced with different modes of acceptance along with different acceptance criteria. It also proved that distributed intuitionistic fuzzy ω-finite state automata accept the same set of languages as intuitionistic fuzzy ω-finite state automata in t-mode and the paper concludes with section 4.

II. PRELIMINARIES

Definition 2.1 Deterministic Finite Automaton (DFA)
A deterministic finite automaton is a quintuple $M = (Q, X, \delta, q_0, F)$, where,
1. $Q$ is a finite set of states,
2. $X$ is a finite input alphabet,
3. $\delta : Q \times X \rightarrow Q$ is the transition function,
4. $q_0$ in $Q$ is the initial state, and
5. $F \subseteq Q$ is the set of final states.

Definition 2.2 Fuzzy ω-Automata
A fuzzy ω-finite state automaton is an $5$-tuple $M = (Q, X, \delta, i, Acc)$, where
1. $Q$ is a finite set of states,
2. $X$ is finite input alphabets,
3. $\delta$ is a fuzzy state transition function defined as $\delta : Q \times X \times Q \rightarrow [0, 1]$,
4. $i$ is an initial distribution function over $Q$, i.e., $i : Q \rightarrow [0, 1]$ is a function,
5. $Acc$ is the acceptance criterion.

Definition 2.3. Intuitionistic Fuzzy ω-Finite State Automata
An intuitionistic fuzzy ω-finite state automaton is an $5$-tuple $M = (Q, X, i = (i_1, i_2), \delta = (\delta_1, \delta_2), Acc)$, where
1. $Q$ is a finite set of states,
2. $X$ is a finite input alphabet,
3. $i = (i_1, i_2)$ is an initial distribution function over $Q$,
4. $\delta = (\delta_1, \delta_2)$ is an intuitionistic fuzzy state transition function defined as
   $\delta_1 : Q \times X \times [0, 1]$ such that $\forall q, p \in Q, \forall x, y \in X$
   $\delta_1(q, x, p) = \begin{cases} 1 & \text{if } q = p \\ 0 & \text{if } q \neq p \end{cases}$
   $\delta_2(q, x, p) = \begin{cases} 1 & \text{if } q = p \\ 0 & \text{if } q \neq p \end{cases}$
   $\delta_1(q, x, y) = \lor [\delta_1(q, x, r) \land \delta_1(r, y, p) : r \in Q] \text{ and }$
   $\delta_2(q, x, y) = \land [\delta_2(q, x, r) \lor \delta_2(r, y, p) : r \in Q],$
5. $Acc$ is the acceptance criterion.

III. DISTRIBUTED INTUITIONISTIC FUZZY ω-FINITE STATE AUTOMATA

Definition 3.1 A Distributed intuitionistic fuzzy n-ω-finite state automaton is an $6$-tuple $M = (Q, X, i = (i_1, i_2), \delta, F, Acc)$, where
1. $Q$ is an $n$-tuple $(Q_1, Q_2, \cdots, Q_n)$, where each $Q_i$ is a set of states.
2. $X$ is the finite set of alphabets.
3. $\delta$ is an $n$-tuple $(\delta_1, \delta_2, \cdots)$ of state transition intuitionistic fuzzy functions where each $\delta_{1i}, \delta_{2i}$ is defined as

Definition 3.3 Consider the ω-word $a = (a(0) a(1) \cdots) \in \mathbb{N}$. A run $M$ on $a$ is a sequence $\rho = \rho(0) \rho(1) \cdots Q^\omega_\text{union}$ such that $\rho(0) = q_0$ for some $q_0 Q^\omega_\text{union}$ with $0 < i_1(q_0) + i_2(q_0) < 1$ and $\delta_1(q(0), a(i), \rho(i + 1)) = \mu(q)$.

Definition 3.4 Let $R$ denote the set of all different runs of $M$ on $a$. Associated with each run $\rho$ are four sequences, $f_i = f(0) f(1) \cdots \in [0, 1]^w$, where $f(0) = i_1(q_0), f(i) = i_2(q_i)$, $g = g(0) g(1) \cdots \in [0, 1]^w$, where $g(0) = i_2(q_0), g(i) = \gamma$, $s = s(0) s(1) \cdots \in [0, 1]^w$, where $s(0) = 1, s(i) = F_i(l)$ and $t = t(0) t(1) \cdots \in [0, 1]^w$, where $t(0) = 0, t(i) = F_2(l)$ of the automaton changes component from $i$ to $l, 1 \leq i, l \leq n$.

Description of each of the modes of acceptance is as follows:

$t$-mode Acceptance:
Initially, the automaton which has a state $q, 0 < i_1(q_0) + i_2(q_0) < 1$ begins processing the input string. Suppose that the system starts from the component $i$. In component $i$ the system follows its transition function as any “stand-alone”.

ω-finite state automaton. The control is transferred from the component $i$ to component $j$ only if the system arrives at a state $q \in Q_i$ and $q \in Q_j$ with an intuitionistic fuzzy value of $(F_1(j), \delta_2(j))$.

The process is repeated infinitely many times and accepted the string if the run of $M$ over the input word satisfies Acc.

Definition 3.5 The instantaneous description of the $n$-intuitionistic-fuzzy-ω-finite state automaton (ID) is given by a 3-tuple $(q, w, i), q Q^\omega_\text{union}, w \in X^n, 1 \leq i \leq n$.

In this ID of the $n$-intuitionistic-fuzzy-ω-finite state automaton, $q$ denotes the current state of the whole system, $w$ the portion of the input string yet to be read and $i$ the index of the component in which the system is currently in. The transition between the ID’s is defined as follows:

1. $(q, aw, i) \rightarrow (q, w, i)$ iff $\delta_1(q, a, q) = \mu \in [0, 1]$ and $\delta_2(q, a, q) = \gamma \in [0, 1]$, where $q, a \in Q_i, w \in X^n, 1 \leq i \leq n$.

2. $(q, aw, i) \rightarrow (q, w, j)$ iff $\delta_1(q, a, q) = \mu \in [0, 1]$ and $\delta_2(q, a, q) = \gamma \in [0, 1]$, where $q, a \in Q_j \cap Q_i, a \in X, w \in X^n, 1 \leq i \leq n$ and $\mu = \min \{\mu_i, F_1(i)\}$ and $\gamma = \max \{\gamma_i, F_2(j)\}$.

Let $\rightarrow$ be the reflexive and transitive closure of $\rightarrow$.

*-mode Acceptance:
Initially, the automaton which has a state $q, 0 < i_1(q_0) + i_2(q_0) < 1$ begins processing the input string. Suppose the system starts the processing from the component $i$. Unlike the termination mode, here there is no restriction. The automaton can transfer the control to any of the components at any time if possible, that is, there is some $j$ such that $q \in Q_j$ then the system can transfer the control to the component $j$ with intuitionistic fuzzy value of $(F_1(j), \delta_2(j))$. The instantaneous description in -mode can be defined analogously.

$= k$-mode (\( < k \)-mode, \( > k \)-mode) Acceptance:
Initially, the automaton which has a state $q, 0 < i_1(q_0) + i_2(q_0) < 1$ begins processing the input string. Suppose the system starts the processing from the component $i$. The system transfers the control to the other component $j$ only after the completion of exactly $k(k < k), k(k > k)$ number of steps in the component $i$, that is, if there is a state $q \in Q_i$ then the transition from component $i$ to the component $j$ takes place only if the system has already completed $k(k(k < k), k(k > k))$ steps in component $i$.

The instantaneous description of the $n$-intuitionistic-fuzzy-ω-finite state automaton in the above three modes of derivations is defined as follows:

Definition 3.6 The instantaneous description of the $n$-intuitionistic-fuzzy-ω-finite state automaton (ID) is given by a 4-tuple $(q, w, i, j), q Q^\omega_\text{union}, w X^n, 1 \leq i \leq n, j \in 0$ is a non-negative integer.

In this ID of the $n$-intuitionistic-fuzzy-ω-finite state automaton, $q$ denotes the current state of the whole system, $w$ the portion of the input string yet to be read; $i$ the index of the component in which the system is currently in and $j$ denotes the number of steps for which the system has been in the $i$th component.

- Let $p^j = p^j(0) p^j(1) \cdots$ be an infinite sequence of elements of $p$, where $p^j(i) = q$ is such that $(q, w, j, k), q Q^\omega_\text{union}, w X^n, 1 \leq j \leq n$ is an instantaneous description of $M$, that is, $p^j(0) = p^j(k), p^j(1) = p^j(2k + 1 + j)$ and so on. $p^j$ is a subsequence of $p$ taking every $k^\text{th}$ element of $p$ starting from $p(k)$.

- Any state reached in the run $p$ of the input alphabet $a$ is a candidate for the final state of the automaton working in the $< k$ mode.

- Let $p = p(0) p(1) \cdots$ be an infinite sequence of elements of $p$, where $p(i) = q$ is such that $(q, w, j, l), q Q^\omega_\text{union}, w X^n, 1 \leq j \leq n, i = k$ is an instantaneous description of $M$, that is, $p(0) = p(l), l = k, p(1) = p(l), l = l + 1$ if the automaton continues in the same component or $l = l + k + 1$ if the automaton changes its component and so on.
Definition 3.7 Depending on \( \ln (p) \) for \( * \), \( t \), \( k \) and \( \ln (p) \) for the \( = k \) and \( > k \) modes and have the following acceptance criteria along with the method of calculating the membership and non-membership value of the accepted string.

1. Büchi Condition:
   \[ \ln (p) \cap F \neq \emptyset \] for an intuitionistic fuzzy final states \( F \subseteq Q_{union} \). Then membership and non-membership value of an accepted string \( a \) is calculated as follows:
   \[ \mu (a) = \max \{ \text{distinct}_\rho (f), \text{distinct}_\rho (s), \mu_f (q), \text{where } q \in \ln (p) \cap F \} \] and
   \[ \gamma (a) = \min \{ \text{distinct}_\rho (g), \text{distinct}_\rho (t), \gamma_f (q), \text{where } q \in \ln (p) \cap F \} \].

2. Muller Condition:
   Let \( F \) be a family of intuitionistic fuzzy final states if \( \land \ln (p) = F \) where \( F \subseteq F \) then the membership and non-membership value of an accepted string \( a \) is calculated as follows:
   \[ \mu (a) = \max \{ \text{distinct}_\rho (f), \text{distinct}_\rho (s), \mu_f (q), \text{where } q \in F \} \] and
   \[ \gamma (a) = \min \{ \text{distinct}_\rho (g), \text{distinct}_\rho (t), \gamma_f (q), \text{where } q \in F \} \].

3. Rabin Condition:
   For a sequence \( \Omega \) of “accepting pairs” \( (E_1, F_1), (E_2, F_2), \ldots, (E_m, F_m) \) with \( E_i, F_i \subseteq Q_{union} \) being intuitionistic fuzzy sets. The membership and non-membership value of an accepted string \( a \) is calculated as follows:
   \[ \mu (a) = \max \{ \text{distinct}_\rho (f), \text{distinct}_\rho (s), \max \{ \mu_{E_1} (q), \mu_{E_2} (p), \text{where } q \in \ln (p) \cap E_i, p \in \ln (p) \cap F_i \} \} \] and
   \[ \gamma (a) = \min \{ \text{distinct}_\rho (g), \text{distinct}_\rho (t), \min \{ \gamma_{E_1} (q), \gamma_{E_2} (p), \text{where } q \in \ln (p) \cap E_i, p \in \ln (p) \cap F_i \} \} \].

4. Streett Condition:
   For a sequence \( \Omega \) of pairs \( (E_1, F_1), (E_2, F_2), \ldots, (E_m, F_m) \) with \( E_i, F_i \subseteq Q_{union} \) being intuitionistic fuzzy sets. The membership and non-membership value of an accepted string \( a \) is calculated as follows:
   \[ \mu (a) = \max \{ \text{distinct}_\rho (f), \text{distinct}_\rho (s), \min \{ \mu_{E_1} (q), \mu_{E_2} (p), \text{where } q \in \ln (p) \cap E_i \cup (\ln (p) \cap F_i), p \in (\ln (p) \cap E_i) \cup (\ln (p) \cap F_i) \} \} \] and
   \[ \gamma (a) = \min \{ \text{distinct}_\rho (g), \text{distinct}_\rho (t), \max \{ \gamma_{E_1} (q), \gamma_{E_2} (p), \text{where } q \in (\ln (p) \cap E_i) \cup (\ln (p) \cap E_i), p \in (\ln (p) \cap F_i) \cup (\ln (p) \cap F_i) \} \} \] where \( \ln (p) \) is replaced by \( \ln (p) \) for the \( = k \) and \( > k \) modes of acceptance.

Example 3.1 Consider the distribution intuitionistic fuzzy w -finite state automaton \( M = (Q, X, \delta, i, \delta, F) \), where
\( Q = \{ q_a, q_b, q_c \} \), \( X = \{ a, b, c \} \),
\( \delta = (\delta_{11}, \delta_{12}, \delta_{13}, \delta_{21}, \delta_{22}, \delta_{23}, \delta_{31}, \delta_{32}) \)
where \( \delta_{1i}, \delta_{2i}, \delta_{3i} \), \( 1 \leq i \leq 4 \) is defined as follows:

\[
\begin{align*}
\delta_{11}(q_a, a, q_a) &= 1.0 & \delta_{31}(q_a, a, q_a) &= 0 \\
\delta_{11}(q_a, b, q_a) &= 1.0 & \delta_{31}(q_a, a, q_a) &= 0 \\
\delta_{12}(q_a, b, q_b) &= 0.9 & \delta_{32}(q_a, b, q_b) &= 0.1 \\
\delta_{13}(q_a, b, q_b) &= 1.0 & \delta_{33}(q_a, b, q_b) &= 0 \\
\delta_{21}(q_b, b, q_b) &= 1.0 & \delta_{22}(q_b, b, q_b) &= 0 \\
\delta_{22}(q_b, c, q_c) &= 0.9 & \delta_{23}(q_b, c, q_c) &= 0.1 \\
\delta_{23}(q_b, c, q_c) &= 1.0 & \delta_{23}(q_b, c, q_c) &= 0 \\
\delta_{31}(q_c, c, q_c) &= 1.0 & \delta_{31}(q_c, c, q_c) &= 0 \\
\delta_{32}(q_c, c, q_c) &= 1.0 & \delta_{32}(q_c, c, q_c) &= 0 \\
\delta_{33}(q_c, c, q_c) &= 1.0 & \delta_{33}(q_c, c, q_c) &= 0 \\
\delta_{41}(q', c, q_c) &= 1.0 & \delta_{43}(q', q', q') &= 0 \\
\delta_{42}(q', q', q') &= 1.0 & \delta_{42}(q', q', q') &= 0 \\
\delta_{43}(q', q', q') &= 1.0 & \delta_{43}(q', q', q') &= 0
\end{align*}
\]

\( F = \{ q_a, q'_a \} \),
\( \mu_f (q_a) = 1, \mu_f (q'_a) = 1 \)
\( \gamma_f (q_a) = 0, \gamma_f (q'_a) = 0 \).
The language accepted by this system in the \( \geq 2 \) and \( * \) modes is given by:
\[
\begin{align*}
L &= \{ a^n b^{2 m} c^w, a^n b^{2 m} c^w \} = 1.0, \gamma (a^n b^{2 m} c^w) = 0, \quad m, n \in \mathbb{Z}^+ \\
a^n b^m c^w, a^n b^m c^w \} = 0.9, \gamma (a^n b^m c^w) = 0.1, & \text{not both } m \text{ and } m \text{ even.}
\end{align*}
\]

Theorem 3.1 For any \( n \)-intuitionistic-fuzzy- \( w \)-finite state automaton \( M \) working in \( t \)-mode and accepting the intuitionistic fuzzy language \( L(M) \) and having a corresponding \( o \)-intuitionistic-fuzzy-\( \delta \)-finite state automaton accepting \( L(M) \).
Proof: Let $M = (Q, X, \delta, i = (i_1, i_2), F, \text{Acc})$ be an $n$-intuitionistic-fuzzy $\omega$-finite state automaton working in $t$-mode, where $\delta = ((\delta_{i_1, i_2}, (\delta_{i_1, i_2}, (\delta_{i_1, i_2}, \cdots (\delta_{i_1, \delta_{i_2}})))$, the components have states $Q_1, Q_2, \cdots Q_n$ and $F$ is an $n$-tuple $((F_{i_1}, F_{i_2}), (F_{i_2}, F_{i_3}) \cdots (F_{i_{n-1}}, F_{i_n}))$ of intuitionistic fuzzy functions.

Consider the intuitionistic fuzzy $\omega$-finite state automaton $M' = (Q, X, \delta = (\delta_{i_1, \delta_{i_2}}), i = (i_1, i_2), F, \text{Acc})$, where $Q' = \{ [q, j] \mid q \in Q_{\text{union}}, 1 \leq j \leq Q_{\text{union}} \}$.

$\delta$ contains the following transitions: for each $\delta_{i_1}(q, a, q_0) = \mu$ and $\delta_{i_2}(q, a, q_0) = \gamma$, $q, q_0 \in Q_0, a \in X, 1 \leq i \leq n$.

1. $\delta_{i_1}(q, a, [q, j]) = \mu$ iff $\delta_{i_2}(q, a, [q, j]) = \gamma$ and $\delta_{i_2}(q, a, [q, j]) = \gamma$.
2. If $q_j \in Q_1$ then $\delta_{i_1}(q_1, a, [q, j]) = \mu$ and $\delta_{i_2}(q_1, a, [q, j]) = \gamma$.
3. If $q_k \in Q_1 \cap Q_2$ then $\delta_{i_2}(q_k, a, [q, j]) = \mu$, $\delta_{i_2}(q_k, a, [q, j]) = \gamma, 1 \leq j \leq n$, $\mu = \min\{\mu, \delta_{i_2}(j, n, [q, j])\}$ and $\gamma = \max\{\gamma, \delta_{i_2}(j, n, [q, j])\}$.

Depending on the difference acceptance criteria and established the following:

$M$ is a Büchi automaton with $F$ the set of final states. Then $M'$ is a Büchi automaton with $F' = \{(q, j) \mid q \in F \text{ and } 1 \leq j \leq n\}$, $\mu'((q, j)) = \mu(q)$ and $\gamma'((q, j)) = \gamma(q)$, $1 \leq j \leq n$ accepting $L(M)$.

Consider the $\omega$-word $\alpha = \alpha(0) \alpha(1) \cdots$ with $\alpha(i) \in X$. A run of $M$ on $\alpha$ is a sequence $\rho = \rho(0) \rho(1) \cdots Q_{\text{union}}$ such that $\delta_{i_1}(\rho(i), \alpha(i), \rho(i+1)) = \mu_{i+1}$ and $\delta_{i_2}(\rho(i), \alpha(i), \rho(i+1)) = \gamma_{i+1}$ for $i \geq 0$ and $1 \leq i \leq n$, with $0 < \mu_{i+1} + \gamma_{i+1} \leq 1$.

Let the run of $M'$ on $\alpha$ be $\rho' = \rho(0) \rho(1) \cdots Q'$. If $q \in \text{In}(\rho) \cap F$ then some $j, 1 \leq j \leq n$ is such that $[q, j] \in Q'$ and $[q, j] \in \text{In}((\rho') \cap F') \text{ since } j$ can take only finite values.

From the construction it is clear that the membership and non-membership value of the accepted string is the same as the one in the distributed automaton. Thus $\alpha$ is accepted by $M'$.

$M$ is a Muller automaton with respect to the family $F \subset 2^Q$ of final state sets. This means that the set of states assumed infinitely often in a run $\rho$ forms a set in $F$. For any set $T = \{q_1, q_2, \cdots, q_l\} \subset F$ define the collection $S_i = \{[(q_i, j)] \mid 1 \leq j \leq n\} \setminus T$.

For any set $S_i \subset S, \mu_{i_1}([q, j]) = \mu(q)$ and $\gamma_{i_1}([q, j]) = \gamma(q)$, $1 \leq j \leq n, 1 \leq i \leq l$ let

$\mathcal{F} = \bigcup_{1 \leq i \leq l} \bigcup_{1 \leq j \leq n} s_i | s_i \in S_i$.

Consider the $\omega$-word $\alpha = \alpha(0) \alpha(1) \cdots$ with $\alpha(i) \in X$. A run of $M$ on $\alpha$ is a sequence $\rho = \rho(0) \rho(1) \cdots Q_{\text{union}}$ such that $\rho(0) = q_0$ and $\delta_{i_1}(\rho(i), \alpha(i), \rho(i+1)) = \mu_{i+1}$ and $\delta_{i_2}(\rho(i), \alpha(i), \rho(i+1)) = \gamma_{i+1}$ for $i \geq 0$ and $1 \leq i \leq n$, with $0 < \mu_{i+1} + \gamma_{i+1} \leq 1$.

Now if $\alpha$ is accepted by $M$ then $\text{In}(\rho) \in \mathcal{S}$ say $\{q_1, q_2, \ldots, q_l\}$.

If $\rho'$ is the run of $\alpha$ on $M'$ then $\text{In}(\rho') = \{[q_1, 1], [q_2, 1], \ldots, [q_l, n]\}$.

which is clearly a set in $\mathcal{F}$ by construction. The membership and non-membership value of $\alpha$ also remains the same. Thus $\alpha$ is accepted by $M'$.

$M$ is a Rabin automaton with respect to the sequence $\Omega$ of accepting pairs $(E_1, F_1) \cdots (E_m, F_m)$ with $E_i, F_i \subset Q_{\text{union}}$. For the automaton $M'$ defined $\Omega$ as $(E_1, F_1) \cdots (E_m, F_m)$, where

$E' = \bigcup_{p \in E_{i_1}} \{[p, j] \mid \mu_{i_1}([q, j]) = \mu_{i_1}(q), \gamma_{i_2}([q, j]) = \gamma_{i_2}(q) \}$ and

$F'_i = \bigcup_{p \in F_{i_1}} \{[p, j] \mid \mu_{i_2}([q, j]) = \mu_{i_2}(q), \gamma_{i_3}([q, j]) = \gamma_{i_3}(q) \}$.

Let $\rho$ be the run of the word $\alpha$ on the machines $M$ and $M'$, respectively. If the condition $(\text{In}(\rho) \cap E_i = \emptyset \vee \text{In}(\rho) \cap F_i = \emptyset)$ holds for some $i$ in $\rho$ then the condition $(\text{In}(\rho') \cap E_i = \emptyset \vee \text{In}(\rho') \cap F_i = \emptyset)$ holds in $\rho'$ implying that $\bigwedge_{i=1}^{m} (\text{In}(\rho^i) \cap E_i = \emptyset \vee \text{In}(\rho^i) \cap F_i = \emptyset)$ holds for the sequence $\Omega$. The membership and non-membership value of $\alpha$ also remains the same. Thus $\alpha$ is accepted by $M'$.

$M$ is a Streett automaton with respect to the sequence $\Omega$ of accepting pairs $(E_1, F_1) \cdots (E_m, F_m)$ with $E_i, F_i \subset Q$. For the automaton $M'$ defined $\Omega$ as $(E_1, F_1) \cdots (E_m, F_m)$, where

$E'_i = \bigcup_{p \in E_{i_1}} \{[p, j] \mid \mu_{i_2}([q, j]) = \mu_{i_2}(q), \gamma_{i_3}([q, j]) = \gamma_{i_3}(q) \}$ and

$F'_i = \bigcup_{p \in F_{i_1}} \{[p, j] \mid \mu_{i_2}([q, j]) = \mu_{i_2}(q), \gamma_{i_3}([q, j]) = \gamma_{i_3}(q) \}$.

Let $\rho$ and $\rho'$ be the run of the word $\alpha$ on the machines $M$ and $M'$, respectively. If the condition $(\text{In}(\rho) \cap E_i = \emptyset \vee \text{In}(\rho) \cap F_i = \emptyset)$ holds for all $i$ in $\rho$ then the condition $(\text{In}(\rho') \cap E_i = \emptyset \vee \text{In}(\rho') \cap F_i = \emptyset)$ holds in $\rho'$ implying that $\bigwedge_{i=1}^{m} (\text{In}(\rho^i) \cap E_i = \emptyset \vee \text{In}(\rho^i) \cap F_i = \emptyset)$ holds for the sequence $\Omega$.

The membership and non-membership value of $\alpha$ also remains the same. Thus $\alpha$ is accepted by $M'$.

IV. CONCLUSION

In this paper, the notion of distributed intuitionistic fuzzy $\omega$-finite state automata is defined according to the use of their acceptance criterion.

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