Università degli Studi di Napoli "Federico II"

Maniac Challenge
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A Diversity Adaptive Approach for Cooperative Behavior

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Outline

Overview
MANIAC Challenge classification

Literature
Iterated Prisoner's Dilemma tournaments experience

Proposed Strategy
Free rider and turncoat

Conclusions

Prisoner's Dilemma (PD)

Node A \ Node B	Cooperate	Defect
Cooperate	(R, R) $(-1+p_a 10, -1+p_b 10)$	(S,T) $(-1, p_b 10)$
Non cooperate	(T,S) $(p_a 10, -1)$	(P,P) (0,0)

where:

- p_a accounts for multi-hop forwarding
- T > R > P > S
- R > (S+T)/2

Best strategy: *always defect*

Iterated Prisoner's Dilemma (IPD)

Iterated Prisoner's Dilemma game:

- actions in a given round can have repercussions in future play
- participants have an incentive to cooperate early to build trust, benefiting so from mutual cooperation later

But does Maniac's rules provide incentives to cooperation?

- no silver metal, no cooperation

IPD tournaments

Key features for a successful strategy:

- *nice*: it is better to cooperate until the opponent cooperates as well;
- *retaliating:* a strategy must not be a blind optimist
- *forgiving:* a strategy should fall back to cooperate if the opponent does not continue to defect;
- *clear:* making it easier for other strategies to predict its behavior so as to facilitate mutually cooperation.

IPD tournaments

First IPD tournament (1984) won by Tit-for-Tat (TFT) strategy:

•cooperate in the first round, and play in the round *n* your opponent's strategy from round *n−1*

TFT satisfies all the previous conditions and dominates for 20 years

IPD tournaments

20th anniversary IPD tournament (2004) won by University of Southampton:

- two players belonging to the same team, namely a *master and a slave*
- same strategy (TFT) against opponent players
- different strategies when one plays against the other

Southampton's proposal shows that cooperation among team's members makes the difference

Different strategies

Each players plays a unique strategy:

•the former player, namely the *free rider*, implements an always defect strategy

it benefits from opponents which adopt not retaliating strategies

•the latter, namely the *turncoat*, plays according to a Tit-for-Tat with Forgiveness (TFTF) strategy

It establishes successful cooperation with retaliating players

Sharing knowledge

Turncoat adapts its strategy by:

•acquiring free rider's knowledge about the opponents' behaviors

•recognizing the non-resilient players, the ones with the free rider

•improving its reward stopping to collaborate with them

Similarly, the free rider can benefit from turncoat's knowledge by trying to collaborate with the resilient players.

Open problems

Issues:

• who has to be considered as opponent in a packet forwarding? The destination node or the previous forwarder (the last hop)

• how the p_a term affects the strategy?