BasketballGAN: Generating Basketball Play Simulation Through Sketching

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Abstract. Given an offensive set play sketch, our method simulates potential scenarios that may occur in the game. The simulation (Fig 1) provides coaches and players with insights on how a given set play can be executed. To achieve the goal, we train a conditional adversarial network on NBA movement data to imitate the behaviors of how players move around the court. Code and User Study are available on GitHub (Fig 4).

Method. Two major components (Fig 2): a generator that learns to generate natural player movements based on a latent noise and a user sketched set play; and a discriminator that is used to evaluate the realism of the basketball play. To improve the quality of simulation, we minimize 1.) a dribbler loss to prevent the ball from drifting away from the dribbler; 2.) a defender loss to prevent the dribbler from not being defended; 3.) a ball passing loss to ensure the straightness of passing trajectories; and 4) an acceleration loss to minimize unnecessary players' movements (Fig 3).

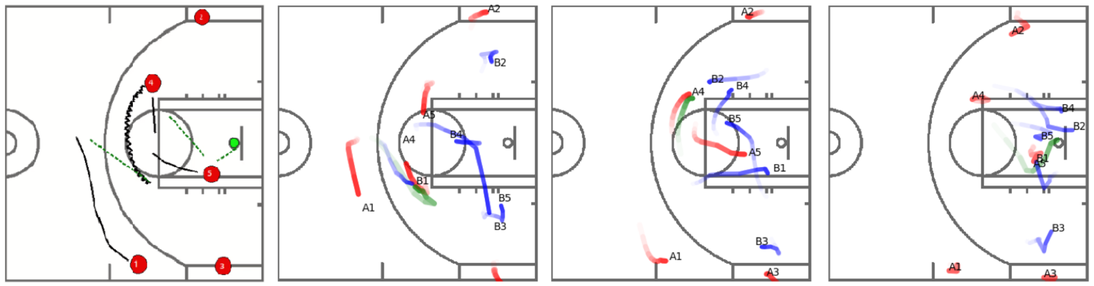

Fig 1: (Left) A sketched basketball offensive tactic. Green and red circles are the ball and the offensive players, respectively; zigzag, smooth, and dotted lines indicate the movements of the dribbler, non-dribblers, and the ball pass, respectively. (Middle left to right) The simulated basketball set play based on the sketched tactic

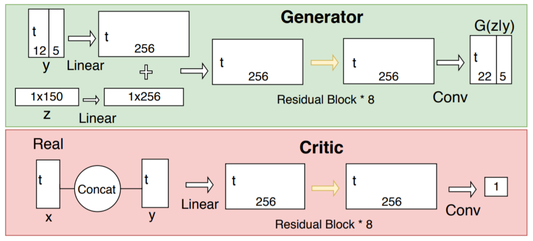

Fig 2: Architectures of the generator and the critic.

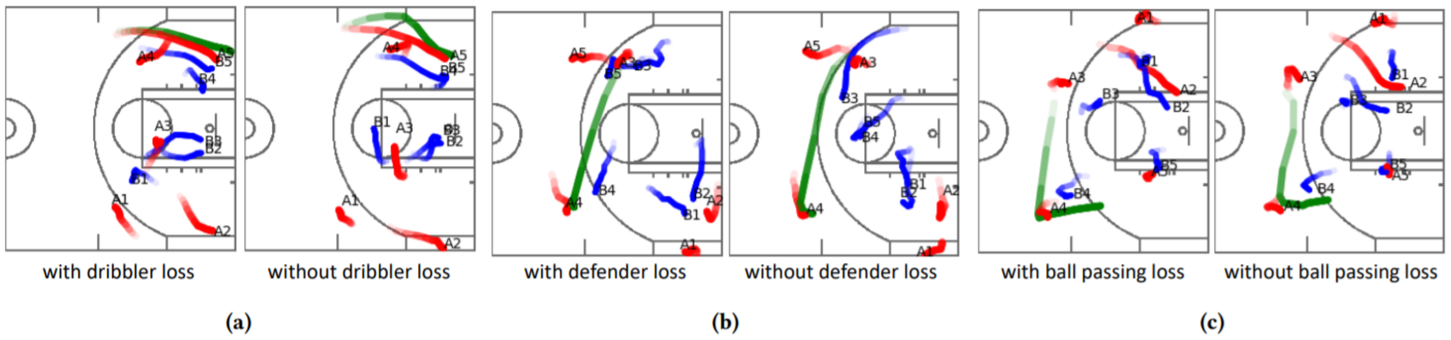

Fig 3: (a) In the top right region, the ball deviates from the ball handler. (b) In the bottom left region, a wide open occurs when the ball is passed from A3 to A4. (c) In the middle left region, the ball passing trajectory is not straight.

	Section 1: true or false						Section 2: left or right					
	Q1	Q2	Q3	Q4	Q5	Q6	Q1	Q2	Q3	Q4	Q5	Q6
ORD	0.32	0.64	0.59	0.50	0.50	0.55	0.41	0.50	0.55	0.50	0.50	0.55
FAN	0.18	0.86	0.59	0.55	0.73	0.59	0.68	0.73	0.40	0.31	0.64	0.59
PRO	0.33	0.83	0.83	0.33	1.00	0.67	0.83	0.83	1.00	0.50	0.67	0.83

Table 1: We show the mean correct rate of each question answered by three different groups.

GitHub Link User Study

Fig 4: QRCodes

Evaluation. To evaluate our system, we objectively compared real and simulated basketball set plays. Besides, a subjective test (Table 1) was conducted to judge whether a set play was real or generated by our network. On average, the mean correct rates to the binary tests were 56.17 %. Experiment results and the evaluations demonstrated the effectiveness of our system.