

1 SUMMARY OF SURVEYED PAPERS

Ref	Year	Venue	Encoding	Objective Function	Content
GAME BITS					
[1]	2018	EvoApplications	Indirect	Direct - Theory Driven	Textures
[2]	2018	EvoApplications	Indirect	Direct - Theory Driven	Textures
[3]	2020	Multimedia Tools and Applications	Indirect	Direct - Theory Driven	Textures
[4]	2022	ToG	Indirect	Direct - Theory Driven	Textures
[5]	2012	T-CIAIG	Indirect	Interactive - Implicit	Sound
[6]	2013	PCGames	Indirect	Interactive - Implicit	Weapons
[7]	2015	CIG	Indirect	Simulation - Static	Weapons
[8]	2016	GEM	Indirect	Direct - Theory Driven	Weapons
[9]	2021	CISTI	Indirect	Direct - Theory Driven	Vegetation
GAME SPACE					
[10]	2012	Soft Computing	Indirect	Direct - Theory Driven	Terrains
[11]	2012	CIG	Indirect	Direct - Theory Driven	Terrains
[12]	2016	EvoCOP	Indirect	Direct - Theory Driven	Terrains
[13]	2011	EvoCOP	Direct and Indirect	Simulation - Static and Direct - Theory Driven	Shooter Maps
[14]	2014	CIG	Direct	Simulation - Static	Shooter Maps
[15]	2015	CEC	Direct	Interactive - Explicit	Shooter Maps
[16]	2017	CIG	Direct	Simulation - Static	Shooter Maps
[17]	2018	TOG	Direct	Simulation - Static and Interactive - Explicit	Shooter Maps
[18]	2012	GAME-ON	Indirect	Simulation - Static	Strategic Maps
[19]	2012	EvoCOP	Indirect	Direct - Theory Driven	Strategic Maps
[20]	2013	Genet. Program. Evolvable Mach.	Indirect	Direct - Theory Driven	Strategic Maps
[21]	2013	GECCO	Direct	Direct - Theory Driven	Strategic Maps
[22]	2013	EvoCOP	Indirect	Simulation - Static	Strategic Maps
[23]	2013	LSSC	Indirect	Simulation - Static	Strategic Maps
[24]	2013	SEED	Indirect	Direct - Theory Driven	Strategic Maps
[25]	2014	Natural Computing	Indirect	Simulation - Static	Strategic Maps
[26]	2014	CEC	Indirect	Direct - Theory Driven	Strategic Maps
[27]	2014	Entertainment Computing	Indirect	Direct - Theory Driven	Strategic Maps
[28]	2015	CEC	Indirect	Direct - Theory Driven	Strategic Maps
[29]	2015	CEC	Indirect	Direct - Theory Driven	Strategic Maps
[30]	2017	CoSECivi	Indirect	Direct - Theory Driven	Strategic Maps
[31]	2018	CIG	Indirect	Direct - Theory Driven	Strategic Maps
[32]	2020	CoG	Indirect	Simulation - Static	Strategic Maps
[33]	2021	TETCI	Indirect	Direct - Theory Driven	Strategic Maps
GAME SYSTEM					
[34]	2012	SBGames	Direct	Simulation - Static	Entity Behaviour
[35]	2013	ECAL	Indirect	Direct - Theory Driven	Entity Behaviour
[36]	2014	SBGames	Direct	Simulation - Static	Entity Behaviour
[37]	2017	GHITALY	Indirect	Direct - Theory Driven	Entity Behaviour
[38]	2017	Soft Computing	Direct	Simulation - Static	Entity Behaviour
[39]	2020	CEC	Indirect	Direct - Theory Driven	Entity Behaviour
[40]	2021	Multimed. Tools Appl.	Indirect	Interactive - Implicit	Entity Behaviour
[41]	2021	JSS	Indirect	Simulation - Static	Entity Behaviour
[42]	2021	SBGames	Indirect	Direct - Theory Driven	Entity Behaviour
[43]	2022	GECCO	Indirect	Direct - Theory Driven	Entity Behaviour
[44]	2022	CoG	Indirect	Direct - Theory Driven	Entity Behaviour
GAME SCENARIOS					
[45]	2011	T-CIAIG	Direct and Indirect	Direct - Theory Driven and Simulation - Static	Mazes
[46]	2011	Computational Intelligence Magazine	Indirect and Direct	Direct - Theory Driven	Mazes

[47]	2011	CEC	Direct and Indirect	Direct - Theory Driven	Mazes
[48]	2011	CIG	Direct and Indirect	Direct - Theory Driven	Mazes
[49]	2012	CIG	Direct and Indirect	Direct - Theory Driven	Mazes
[50]	2015	ACALCI	Direct and Indirect	Direct - Theory Driven	Mazes
[51]	2015	CGAMES	Direct	Direct - Theory Driven	Mazes
[52]	2016	Connection Science	Direct and Indirect	Direct - Theory Driven	Mazes
[53]	2016	CEC	Direct	Direct - Theory Driven	Mazes
[54]	2018	IIAI-AAI	Direct	Direct - Theory Driven	Mazes
[55]	2013	CIG	Indirect	Direct - Theory Driven	Physics
[56]	2014	ACE	Direct	Simulation - Static	Physics
[57]	2014	CIG	Direct	Simulation - Static	Physics
[58]	2015	GCCE	Indirect	Interactive - Implicit	Physics
[59]	2016	EvoCOP	Indirect	Direct - Theory Driven and Simulation - Static	Physics
[60]	2017	T-CIAIG	Direct	Simulation - Static	Physics
[61]	2019	EvoApplications	Indirect	Direct - Theory Driven and Simulation - Static	Physics
[62]	2019	IJCCI	Indirect	Simulation - Static	Physics
[63]	2019	GECCO	Direct	Simulation - Static	Physics
[64]	2020	OLA	Direct	Direct - Theory driven and Simulation - Static	Physics
[65]	2011	T-CIAIG	Indirect	Simulation - Static	Tracks
[66]	2011	GECCO	Indirect	Interactive - Explicit	Tracks
[67]	2015	Applied Soft Computing	Indirect	Interactive - Explicit	Tracks
[68]	2016	IJEEI	Indirect	Direct - Theory Driven	Tracks
[69]	2012	PCGames PCG Workshop	Indirect	Simulation - Static	Rooms
[70]	2015	CEEC	Indirect	Simulation - Static	Rooms
[71]	2019	CoG	Direct	Simulation - Static	Rooms
[72]	2019	ICGA	Indirect	Direct - Theory Driven	Rooms
[73]	2020	Applied Soft Computing	Direct	Simulation - Static	Rooms
[74]	2020	FDG	Direct	Simulation - Static	Rooms
[74]	2020	CoG	Direct	Simulation - Static	Rooms
[75]	2020	ToG	Direct	Interactive - Explicit	Rooms
[76]	2020	AIIDE	Indirect	Direct - Theory Driven	Rooms
[77]	2021	ISSSR	Direct	Simulation - Static	Rooms
[78]	2021	NT	Indirect	Direct - Theory Driven	Rooms
[79]	2021	ToG	Direct	Direct - Data Driven	Rooms
[80]	2022	SBGames	Indirect	Direct - Theory Driven	Rooms
[81]	2022	FDG	Direct	Simulation - Static	Rooms
[82]	2022	Appliad Science	Direct	Direct - Theory Driven	Rooms
[83]	2022	SIC	Direct	Direct - Theory Driven	Rooms
[84]	2012	ICPS	Indirect	Direct - Theory Driven	Dungeon
[85]	2016	EvoCOP	Indirect	Direct - Theory Driven	Dungeon
[86]	2017	CEEC	Indirect	Direct - Theory Driven	Dungeon
[87]	2017	GECCO	Indirect	Direct - Theory Driven	Dungeon
[88]	2018	Computers	Indirect	Direct - Theory Driven	Dungeon
[89]	2018	Computation CEC	Indirect	Direct - Theory Driven	Dungeon
[90]	2018	CIG	Direct	Direct - Theory Driven	Dungeon
[91]	2018	SBGames	Indirect	Direct - Theory Driven	Dungeon
[92]	2018	ToG	Direct	Direct - Theory Driven	Dungeon
[93]	2020	Applied Intelligence	Direct	Direct - Theory Driven	Dungeon
[94]	2021	Expert Syst. Appl.	Indirect	Simulation - Static	Dungeon
[95]	2022	Applied Soft Computing	Direct	Direct - Theory Driven	Dungeon
[96]	2011	ACE	Direct	Direct - Theory Driven	Timeline
[97]	2013	CIG	Indirect	Direct - Theory Driven	Timeline
[98]	2013	DPG	Indirect	Direct - Theory Driven	Timeline
[99]	2014	EvoCOP	Indirect	Direct - Theory Driven	Timeline
[100]	2015	EvoCOP	Indirect	Simulation - Static	Timeline
[101]	2017	CSIEC	Indirect	Direct - Theory	Timeline

[102]	2018	FDG	Indirect	Direct - Theory and Simulation - Static	Timeline
[103]	2018	EECSI	Indirect	Direct - Theory	Timeline
[104]	2019	GECCO	Indirect	Simulation - Static	Timeline
[105]	2019	CoG	Indirect	Simulation - Static	Timeline
[106]	2020	JPCS	Indirect	Simulation - Static	Timeline
[107]	2020	GECCO	Direct	Simulation - Static	Timeline
[108]	2022	Genet. Program. Evolvable Mach.	Indirect	Direct - Theory Driven	Timeline
[109]	2021	GI	Indirect	Direct - Theory Driven	Stories
[110]	2021	FDG	Indirect	Direct - Theory Driven	Stories
[111]	2022	FDG	Indirect	Direct - Theory Driven	Stories
[112]	2022	FDG	Indirect	Direct - Theory Driven	Stories
[113]	2022	Entertain. Comput.	Indirect	Direct - Theory Driven	Stories
GAME DESIGN					
[114]	2014	IJAIT	Indirect	Simulation - Static	System Design
[115]	2015		Indirect	Simulation - Static	System Design
[116]	2016	EvoCOP Arxiv	Indirect	Simulation - Static	System Design
[117]	2012	EvoCOP	Indirect	Direct - Theory	Camera Control

REFERENCES

- [1] J. Kowalski, A. Liapis, and Ł. Żarczyński, "Mapping chess aesthetics onto procedurally generated chess-like games," in *International Conference on the Applications of Evolutionary Computation*. Springer, 2018, pp. 325–341.
- [2] A. Liapis, "Recomposing the pokémon color palette," in *International Conference on the Applications of Evolutionary Computation*. Springer, 2018, pp. 308–324.
- [3] A. Bernardi, D. Gadia, D. Maggiorini, C. E. Palazzi, and L. A. Ripamonti, "Procedural generation of materials for real-time rendering," *Multimedia Tools and Applications*, pp. 1–22, 2020.
- [4] J. A. Brown and M. Scirea, "Evolving woodland camouflage," *IEEE Transactions on Games*, 2022.
- [5] D. Plans and D. Morelli, "Experience-driven procedural music generation for games," *IEEE Transactions on Computational Intelligence and AI in Games*, vol. 4, no. 3, pp. 192–198, 2012.
- [6] E. McDuffee and A. Pantaleev, "Team blockhead wars: Generating fps weapons in a multiplayer environment," in *Proceedings of the Second Workshop on Procedural Content Generation in Games*, 2013.
- [7] D. Gravina and D. Loiacono, "Procedural weapons generation for unreal tournament iii," in *2015 IEEE Games entertainment media conference (GEM)*. IEEE, 2015, pp. 1–8.
- [8] D. Gravina, A. Liapis, and G. N. Yannakakis, "Constrained surprise search for content generation," in *2016 IEEE Conference on Computational Intelligence and Games (CIG)*. IEEE, 2016, pp. 1–8.
- [9] C. Mora, S. Jardim, and J. Valente, "Flora generation and evolution algorithm for virtual environments," in *2021 16th Iberian Conference on Information Systems and Technologies (CISTI)*. IEEE, 2021, pp. 1–6.
- [10] M. Frade, F. F. de Vega, and C. Cotta, "Automatic evolution of programs for procedural generation of terrains for video games," *Soft Computing*, vol. 16, no. 11, pp. 1893–1914, 2012.
- [11] —, "Aesthetic terrain programs database for creativity assessment," in *2012 IEEE Conference on Computational Intelligence and Games (CIG)*. IEEE, 2012, pp. 350–354.
- [12] A. Pech, C.-P. Lam, P. Hingston, and M. Masek, "Using isovists to evolve terrains with gameplay elements," in *European Conference on the Applications of Evolutionary Computation*. Springer, 2016, pp. 636–652.
- [13] L. Cardamone, G. N. Yannakakis, J. Togelius, and P. L. Lanzi, "Evolving interesting maps for a first person shooter," in *European Conference on the Applications of Evolutionary Computation*. Springer, 2011, pp. 63–72.
- [14] P. L. Lanzi, D. Loiacono, and R. Stucchi, "Evolving maps for match balancing in first person shooters," in *2014 IEEE Conference on Computational Intelligence and Games*. IEEE, 2014, pp. 1–8.
- [15] P. T. Ølsted, B. Ma, and S. Risi, "Interactive evolution of levels for a competitive multiplayer fps," in *2015 IEEE Congress on Evolutionary Computation (CEC)*. IEEE, 2015, pp. 1527–1534.
- [16] D. Loiacono and L. Arnaboldi, "Fight or flight: Evolving maps for cube 2 to foster a fleeing behavior," in *2017 IEEE Conference on Computational Intelligence and Games (CIG)*. IEEE, 2017, pp. 199–206.
- [17] —, "Multiobjective evolutionary map design for cube 2: Sauerbraten," *IEEE Transactions on Games*, vol. 11, no. 1, pp. 36–47, 2018.
- [18] R. Lara-Cabrera, C. Cotta, and A. J. Fernández-Leiva, "Procedural map generation for a rts game," in *13th International GAME-ON Conference on Intelligent Games and Simulation*. Malaga (Spain): Eurosia, 2012, pp. 53–58.
- [19] T. Mahlmann, J. Togelius, and G. N. Yannakakis, "Spicing up map generation," in *European Conference on the Applications of Evolutionary Computation*. Springer, 2012, pp. 224–233.
- [20] J. Togelius, M. Preuss, N. Beume, S. Wessing, J. Hagelbäck, G. N. Yannakakis, and C. Grappiolo, "Controllable procedural map generation via multiobjective evolution," *Genetic Programming and Evolvable Machines*, vol. 14, no. 2, pp. 245–277, 2013.
- [21] A. Liapis, G. N. Yannakakis, and J. Togelius, "Enhancements to constrained novelty search: Two-population novelty search for generating game content," in *Proceedings of the 15th annual conference on Genetic and evolutionary computation*, 2013, pp. 343–350.
- [22] R. Lara-Cabrera, C. Cotta, and A. J. Fernández-Leiva, "A procedural balanced map generator with self-adaptive complexity for the real-time strategy game planet wars," in *European Conference on the Applications of Evolutionary Computation*. Springer, 2013, pp. 274–283.
- [23] —, "Using self-adaptive evolutionary algorithms to evolve dynamism-oriented maps for a real time strategy game," in *International Conference on Large-Scale Scientific Computing*. Springer, 2013, pp. 256–263.
- [24] R. Lara-Cabrera, C. Cotta, A. J. Fernández-Leiva *et al.*, "Evolving aesthetic maps for a real time strategy game," 2013.
- [25] R. Lara-Cabrera, C. Cotta, and A. J. Fernández-Leiva, "On balance and dynamism in procedural content generation with self-adaptive evolutionary algorithms," *Natural Computing*, vol. 13, no. 2, pp. 157–168, 2014.
- [26] R. Lara-Cabrera, C. Cotta, and A. J. Fernández-Leiva, "A self-adaptive evolutionary approach to the evolution of aesthetic maps for a rts game," in *2014 IEEE Congress on Evolutionary Computation (CEC)*. IEEE, 2014, pp. 298–304.

- [27] R. Lara-Cabrera, C. Cotta, and A. Fernández-Leiva, “Geometrical vs topological measures for the evolution of aesthetic maps in a rts game,” *Entertainment Computing*, vol. 5, no. 4, pp. 251–258, 2014.
- [28] G. A. Barros and J. Togelius, “Balanced civilization map generation based on open data,” in *2015 IEEE Congress on Evolutionary Computation (CEC)*. IEEE, 2015, pp. 1482–1489.
- [29] A. Liapis, G. N. Yannakakis, and J. Togelius, “Constrained novelty search: A study on game content generation,” *Evolutionary computation*, vol. 23, no. 1, pp. 101–129, 2015.
- [30] R. Lara-Cabrera, V. Rodríguez-Fernández, J. Paz-Sedano, and D. Camacho, “Procedural generation of balanced levels for a 3d paintball game,” in *CoSECivi*, 2017, pp. 43–55.
- [31] J. Kowalski, R. Miernik, P. Pytlik, M. Pawlikowski, K. Piecuch, and J. Sekowski, “Strategic features and terrain generation for balanced heroes of might and magic iii maps,” in *2018 IEEE Conference on Computational Intelligence and Games (CIG)*. IEEE, 2018, pp. 1–8.
- [32] M. C. Green, L. Mugrai, A. Khalifa, and J. Togelius, “Mario level generation from mechanics using scene stitching,” in *2020 IEEE Conference on Games (CoG)*. IEEE, 2020, pp. 49–56.
- [33] L. Ma, S. Cheng, M. Shi, and Y. Guo, “Angle-based multi-objective evolutionary algorithm based on pruning-power indicator for game map generation,” *IEEE Transactions on Emerging Topics in Computational Intelligence*, vol. 6, no. 2, pp. 341–354, 2021.
- [34] A. S. Ruela and F. G. Guimaraes, “Evolving battle formations in massively multiplayer online strategy games,” in *SBC-Proc. of the Brazilian Symposium on Games and Digital Entertainment-SBGames*, 2012, pp. 49–55.
- [35] A. Guarneri, D. Maggiorini, L. Ripamonti, and M. Trubian, “Golem: generator of life embedded into mmos,” in *ECAL 2013: The Twelfth European Conference on Artificial Life*. MIT press, 2013, pp. 585–592.
- [36] A. S. Ruela and F. G. Guimaraes, “Coevolutionary procedural generation of battle formations in massively multiplayer online strategy games,” in *2014 Brazilian Symposium on Computer Games and Digital Entertainment*. IEEE, 2014, pp. 89–98.
- [37] D. Norton, L. A. Ripamonti, M. Ornaghi, D. Gadia, and D. Maggiorini, “Monsters of darwin: A strategic game based on artificial intelligence and genetic algorithms,” in *GHITALY*, vol. 1956. CEUR-WS, 2017.
- [38] A. S. Ruela and F. G. Guimarães, “Procedural generation of non-player characters in massively multiplayer online strategy games,” *Soft Computing*, vol. 21, no. 23, pp. 7005–7020, 2017.
- [39] J. A. Brown, D. Ashlock, S. Houghten, and A. Romualdo, “Evolutionary graph compression and diffusion methods for city discovery in role playing games,” in *2020 IEEE Congress on Evolutionary Computation (CEC)*. IEEE, 2020, pp. 1–8.
- [40] L. A. Ripamonti, F. Distefano, M. Trubian, D. Maggiorini, and D. Gadia, “Dragon: diversity regulated adaptive generator online,” *Multimedia Tools and Applications*, vol. 80, no. 26, pp. 34 933–34 969, 2021.
- [41] D. Blasco, J. Font, M. Zamorano, and C. Cetina, “An evolutionary approach for generating software models: The case of kromaia in game software engineering,” *Journal of Systems and Software*, vol. 171, p. 110804, 2021.
- [42] L. T. Pereira, B. M. Viana, and C. F. Toledo, “Procedural enemy generation through parallel evolutionary algorithm,” in *2021 20th Brazilian Symposium on Computer Games and Digital Entertainment (SBGames)*. IEEE, 2021, pp. 126–135.
- [43] R. Gallotta, K. Arulkumaran, and L. Soros, “Evolving spaceships with a hybrid l-system constrained optimisation evolutionary algorithm,” in *Proceedings of the Genetic and Evolutionary Computation Conference Companion*, 2022, pp. 711–714.
- [44] B. M. Viana, L. T. Pereira, and C. F. Toledo, “Illuminating the space of enemies through map-elites,” in *2022 IEEE Conference on Games (CoG)*. IEEE, 2022, pp. 17–24.
- [45] D. Ashlock, C. Lee, and C. McGuinness, “Search-based procedural generation of maze-like levels,” *IEEE Transactions on Computational Intelligence and AI in Games*, vol. 3, no. 3, pp. 260–273, 2011.
- [46] —, “Simultaneous dual level creation for games,” *IEEE Computational Intelligence Magazine*, vol. 6, no. 2, pp. 26–37, 2011.
- [47] C. McGuinness and D. Ashlock, “Decomposing the level generation problem with tiles,” in *2011 IEEE Congress of Evolutionary Computation (CEC)*. IEEE, 2011, pp. 849–856.
- [48] —, “Incorporating required structure into tiles,” in *2011 IEEE Conference on Computational Intelligence and Games (CIG’11)*. IEEE, 2011, pp. 16–23.
- [49] C. McGuinness, “Statistical analyses of representation choice in level generation,” in *2012 IEEE Conference on Computational Intelligence and Games (CIG)*. IEEE, 2012, pp. 312–319.
- [50] A. Pech, P. Hingston, M. Masek, and C. P. Lam, “Evolving cellular automata for maze generation,” in *Australasian conference on artificial life and computational intelligence*. Springer, 2015, pp. 112–124.
- [51] P. H. Kim and R. Crawfis, “The quest for the perfect perfect-maze,” in *2015 Computer Games: AI, Animation, Mobile, Multimedia, Educational and Serious Games (CGAMES)*. IEEE, 2015, pp. 65–72.
- [52] A. Pech, M. Masek, C.-P. Lam, and P. Hingston, “Game level layout generation using evolved cellular automata,” *Connection Science*, vol. 28, no. 1, pp. 63–82, 2016.
- [53] C. McGuinness, “Multiple pass monte carlo tree search,” in *2016 IEEE Congress on Evolutionary Computation (CEC)*. IEEE, 2016, pp. 1555–1561.
- [54] P. H. Kim and R. Crawfis, “Intelligent maze generation based on topological constraints,” in *2018 7th International Congress on Advanced Applied Informatics (IIAI-AAI)*. IEEE, 2018, pp. 867–872.
- [55] M. Shaker, M. H. Sarhan, O. Al Naameh, N. Shaker, and J. Togelius, “Automatic generation and analysis of physics-based puzzle games,” in *2013 IEEE Conference on Computational Intelligence in Games (CIG)*. IEEE, 2013, pp. 1–8.
- [56] L. Ferreira and C. Toledo, “Generating levels for physics-based puzzle games with estimation of distribution algorithms,” in *Proceedings of the 11th Conference on Advances in Computer Entertainment Technology*, 2014, pp. 1–6.
- [57] —, “A search-based approach for generating angry birds levels,” in *2014 IEEE Conference on Computational Intelligence and Games*. IEEE, 2014, pp. 1–8.
- [58] M. Kaidan, C. Y. Chu, T. Harada, and R. Thawonmas, “Procedural generation of angry birds levels that adapt to the player’s skills using genetic algorithm,” in *2015 IEEE 4th Global Conference on Consumer Electronics (GCCE)*. IEEE, 2015, pp. 535–536.
- [59] R. Lara-Cabrera, A. Gutierrez-Alcoba, and A. J. Fernández-Leiva, “A spatially-structured psg method for content diversity in a physics-based simulation game,” in *European Conference on the Applications of Evolutionary Computation*. Springer, 2016, pp. 653–668.
- [60] L. N. Ferreira and C. F. M. Toledo, “Tanager: A generator of feasible and engaging levels for angry birds,” *IEEE Transactions on Games*, vol. 10, no. 3, pp. 304–316, 2017.
- [61] L. Calle, J. J. Merelo, A. Mora-García, and J.-M. García-Valdez, “Free form evolution for angry birds level generation,” in *International Conference on the Applications of Evolutionary Computation (Part of EvoStar)*. Springer, 2019, pp. 125–140.
- [62] L. Calle, J. J. M. Guervós, M. G. Valdez, and A. M. García, “Speeding up evaluation of structures for the angry birds game,” in *IJCCI*, 2019, pp. 237–244.
- [63] L. Calle, J.-J. Merelo-Guervós, A. Mora-García, and M. G. Valdez, “Improved free form evolution for angry birds structures,” in *Proceedings of the Genetic and Evolutionary Computation Conference Companion*, 2019, pp. 133–134.
- [64] C. López-Rodríguez, A. J. Fernández-Leiva, R. Lara-Cabrera, A. M. Mora, and P. García-Sánchez, “Checking the difficulty of evolutionary-generated maps in a n-body inspired mobile game,” in *International Conference on Optimization and Learning*. Springer, 2020, pp. 206–215.
- [65] D. Loiacono, L. Cardamone, and P. L. Lanzi, “Automatic track generation for high-end racing games using evolutionary computation,” *IEEE Transactions on Computational Intelligence and AI in Games*, vol. 3, no. 3, pp. 245–259, 2011.
- [66] L. Cardamone, D. Loiacono, and P. L. Lanzi, “Interactive evolution for the procedural generation of tracks in a high-end racing game,” in *Proceedings of the 13th annual conference on Genetic and evolutionary computation*, 2011, pp. 395–402.

- [67] L. Cardamone, P. L. Lanzi, and D. Loiacono, "Trackgen: An interactive track generator for torcs and speed-dreams," *Applied Soft Computing*, vol. 28, pp. 550–558, 2015.
- [68] H. A. Prasetya and N. U. Maulidevi, "Search-based procedural content generation for race tracks in video games," *International Journal on Electrical Engineering & Informatics*, vol. 8, no. 4, 2016.
- [69] J. Togelius, T. Justinussen, and A. Hartzen, "Compositional procedural content generation," in *Proceedings of the The third workshop on Procedural Content Generation in Games*, 2012, pp. 1–4.
- [70] X. Neufeld, S. Mostaghim, and D. Perez-Liebana, "Procedural level generation with answer set programming for general video game playing," in *2015 7th Computer Science and Electronic Engineering Conference (CEECE)*. IEEE, 2015, pp. 207–212.
- [71] O. Drageset, M. H. Winands, R. D. Gaina, and D. Perez-Liebana, "Optimising level generators for general video game ai," in *2019 IEEE Conference on Games (CoG)*. IEEE, 2019, pp. 1–8.
- [72] A. Zafar, H. Muhtaba, M. T. Baig, and M. O. Beg, "Using patterns as objectives for general video game level generation," *ICGA Journal*, vol. 41, no. 2, pp. 66–77, 2019.
- [73] A. Zafar, H. Muhtaba, and M. O. Beg, "Search-based procedural content generation for gvg-ig," *Applied Soft Computing*, vol. 86, p. 105909, 2020.
- [74] M. Charity, M. C. Green, A. Khalifa, and J. Togelius, "Mech-elites: Illuminating the mechanic space of gvg-ai," in *International Conference on the Foundations of Digital Games*, 2020, pp. 1–10.
- [75] A. Alvarez, S. Dahlskog, J. Font, and J. Togelius, "Interactive constrained map-elites: Analysis and evaluation of the expressiveness of the feature dimensions," *IEEE Transactions on Games*, vol. 14, no. 2, pp. 202–211, 2020.
- [76] D. Bhaumik, A. Khalifa, M. Green, and J. Togelius, "Tree search versus optimization approaches for map generation," in *Proceedings of the AAAI Conference on Artificial Intelligence and Interactive Digital Entertainment*, vol. 16, no. 1, 2020, pp. 24–30.
- [77] Z. Deng and Y. Xiang, "Roads to what we want: A game generator based on reverse design," in *2021 7th International Symposium on System and Software Reliability (ISSSR)*. IEEE, 2021, pp. 198–205.
- [78] V. Kraner, I. Fister Jr, and L. Brežočanik, "Procedural content generation of custom tower defense game using genetic algorithms," in *International Conference "New Technologies, Development and Applications"*. Springer, 2021, pp. 493–503.
- [79] S. Walton, A. Rahat, and J. Stovold, "Evaluating mixed-initiative procedural level design tools using a triple-blind mixed-method user study," *IEEE Transactions on Games*, 2021.
- [80] A. O. Franco, W. Franco, J. G. Maia, and M. Franklin, "Generating rooms using generative grammars and genetic algorithms," in *2022 21st Brazilian Symposium on Computer Games and Digital Entertainment (SBGames)*. IEEE, 2022, pp. 1–6.
- [81] M. C. Green, A. Khalifa, and J. Togelius, "Persona-driven dominant/submissive map (pdsmap) generation for tutorials," in *Proceedings of the 17th International Conference on the Foundations of Digital Games*, 2022, pp. 1–10.
- [82] A. Petrovas and R. Bausys, "Procedural video game scene generation by genetic and neutrosophic waspas algorithms," *Applied Sciences*, vol. 12, no. 2, p. 772, 2022.
- [83] A. Petrovas, R. Baušys, E. K. Zavadskas, and F. Smarandache, "Generation of creative game scene patterns by the neutrosophic genetic cocoso method," *Studies in informatics and control*, vol. 31, no. 4, pp. 5–11, 2022.
- [84] V. Valtchanov and J. A. Brown, "Evolving dungeon crawler levels with relative placement," in *Proceedings of the Fifth International C* Conference on Computer Science and Software Engineering*, 2012, pp. 27–35.
- [85] J. M. Font, R. Izquierdo, D. Manrique, and J. Togelius, "Constrained level generation through grammar-based evolutionary algorithms," in *European Conference on the Applications of Evolutionary Computation*. Springer, 2016, pp. 558–573.
- [86] J. A. Brown, B. Lutfullin, and P. Oreshin, "Procedural content generation of level layouts for hotline miami," in *2017 9th Computer Science and Electronic Engineering (CEECE)*. IEEE, 2017, pp. 106–111.
- [87] A. Liapis, "Multi-segment evolution of dungeon game levels," in *Proceedings of the Genetic and Evolutionary Computation Conference*, 2017, pp. 203–210.
- [88] J. A. Brown, B. Lutfullin, P. Oreshin, and I. Pyatkin, "Levels for hotline miami 2: Wrong number using procedural content generations," *Computers*, vol. 7, no. 2, p. 22, 2018.
- [89] L. T. Pereira, P. V. Prado, and C. Toledo, "Evolving dungeon maps with locked door missions," in *2018 IEEE Congress on Evolutionary Computation (CEC)*. IEEE, 2018, pp. 1–8.
- [90] A. S. Ruela and K. V. Delgado, "Scale-free evolutionary level generation," in *2018 IEEE Conference on Computational Intelligence and Games (CIG)*. IEEE, 2018, pp. 1–8.
- [91] —, "Evolving lock-and-key puzzles based on nonlinear player progression and level exploration," *SBC-Proceedings of SBGames*, pp. 651–654, 2018.
- [92] A. S. Melotti and C. H. V. de Moraes, "Evolving roguelike dungeons with deluged novelty search local competition," *IEEE Transactions on Games*, vol. 11, no. 2, pp. 173–182, 2018.
- [93] A. S. Ruela, K. V. Delgado, and J. Bernardes, "A multi-objective evolutionary approach for the nonlinear scale-free level problem," *Applied Intelligence*, vol. 50, no. 12, pp. 4223–4240, 2020.
- [94] L. T. Pereira, P. V. de Souza Prado, R. M. Lopes, and C. F. M. Toledo, "Procedural generation of dungeons' maps and locked-door missions through an evolutionary algorithm validated with players," *Expert Systems with Applications*, vol. 180, p. 115009, 2021.
- [95] B. M. Viana, L. T. Pereira, C. F. Toledo, S. R. dos Santos, and S. M. Maia, "Feasible–infeasible two-population genetic algorithm to evolve dungeon levels with dependencies in barrier mechanics," *Applied Soft Computing*, vol. 119, p. 108586, 2022.
- [96] F. Mourato, M. P. dos Santos, and F. Birra, "Automatic level generation for platform videogames using genetic algorithms," in *Proceedings of the 8th International Conference on Advances in Computer Entertainment Technology*, 2011, pp. 1–8.
- [97] D.-F. H. Adrian and S.-G. C. A. Luisa, "An approach to level design using procedural content generation and difficulty curves," in *2013 IEEE Conference on Computational Intelligence in Games (CIG)*. IEEE, 2013, pp. 1–8.
- [98] S. Dahlskog and J. Togelius, "Patterns as objectives for level generation," in *Design Patterns in Games (DPG), Chania, Crete, Greece (2013)*. ACM Digital Library, 2013.
- [99] —, "Procedural content generation using patterns as objectives," in *European Conference on the Applications of Evolutionary Computation*. Springer, 2014, pp. 325–336.
- [100] M. Shaker, N. Shaker, J. Togelius, and M. Abou-Zleikha, "A progressive approach to content generation," in *European Conference on the Applications of Evolutionary Computation*. Springer, 2015, pp. 381–393.
- [101] A. B. Moghadam and M. K. Rafsanjani, "A genetic approach in procedural content generation for platformer games level creation," in *2017 2nd Conference on Swarm Intelligence and Evolutionary Computation (CSIEC)*. IEEE, 2017, pp. 141–146.
- [102] M. C. Green, A. Khalifa, G. A. Barros, A. Nealen, and J. Togelius, "Generating levels that teach mechanics," in *Proceedings of the 13th International Conference on the Foundations of Digital Games*, 2018, pp. 1–8.
- [103] A. S. Kholimi, A. Hamdani, and L. Husniah, "Automatic game world generation for platformer games using genetic algorithm," in *2018 5th International Conference on Electrical Engineering, Computer Science and Informatics (EECSI)*. IEEE, 2018, pp. 495–498.
- [104] A. Khalifa, M. C. Green, G. Barros, and J. Togelius, "Intentional computational level design," in *Proceedings of The Genetic and Evolutionary Computation Conference*, 2019, pp. 796–803.
- [105] V. R. Warriar, C. Ugarte, J. R. Woodward, and L. Tokarchuk, "Playmapper: Illuminating design spaces of platform games," in *2019 IEEE Conference on Games (CoG)*. IEEE, 2019, pp. 1–4.
- [106] P. W. Atmaja, Sugianto, and E. P. Mandyartha, "Difficulty curve-based procedural generation of scrolling shooter enemy formations," in *Journal of Physics: Conference Series*, vol. 1569, no. 2. IOP Publishing, 2020, p. 022049.

- [107] O. Withington, “Illuminating super mario bros: quality-diversity within platformer level generation,” in *Proceedings of the 2020 Genetic and Evolutionary Computation Conference Companion*, 2020, pp. 223–224.
- [108] A. Moradi Karkaj and S. Lotfi, “Using estimation of distribution algorithm for procedural content generation in video games,” *Genetic Programming and Evolvable Machines*, vol. 23, no. 4, pp. 495–533, 2022.
- [109] E. M. Fredericks and B. DeVries, “(genetically) improving novelty in procedural story generation,” in *2021 IEEE/ACM International Workshop on Genetic Improvement (GI)*. IEEE, 2021, pp. 39–40.
- [110] A. Alvarez, E. Grevillius, E. Olsson, and J. Font, “Questgram [qq]: Toward a mixed-initiative quest generation tool,” in *Proceedings of the 16th International Conference on the Foundations of Digital Games*, 2021, pp. 1–10.
- [111] A. Alvarez, J. Font, and J. Togelius, “Story designer: Towards a mixed-initiative tool to create narrative structures,” in *Proceedings of the 17th International Conference on the Foundations of Digital Games*, 2022, pp. 1–9.
- [112] A. Alvarez and J. Font, “Tropetwist: Trope-based narrative structure generation,” in *Proceedings of the 17th International Conference on the Foundations of Digital Games*, 2022, pp. 1–8.
- [113] E. S. de Lima, B. Feijó, and A. L. Furtado, “Procedural generation of branching quests for games,” *Entertainment Computing*, vol. 43, p. 100491, 2022.
- [114] Z. Halim, A. R. Baig, and K. Zafar, “Evolutionary search in the space of rules for creation of new two-player board games,” *International Journal on Artificial Intelligence Tools*, vol. 23, no. 02, p. 1350028, 2014.
- [115] J. Kowalski and M. Szykuła, “Procedural content generation for gdl descriptions of simplified boardgames,” *arXiv preprint arXiv:1508.00212*, 2015.
- [116] —, “Evolving chess-like games using relative algorithm performance profiles,” in *European Conference on the Applications of Evolutionary Computation*. Springer, 2016, pp. 574–589.
- [117] M. Preuss, P. Burelli, and G. N. Yannakakis, “Diversified virtual camera composition,” in *European Conference on the Applications of Evolutionary Computation*. Springer, 2012, pp. 265–274.