Towards automatic StarCraft strategy generation using genetic programming

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Who are we?

ugr | Universidad de Granada

POLITECNICO DI TORINO

INRA
SCIENCE & IMPACT

Why do we deserve the prize?

Videogames are cool

(cc) commons.wikimedia.org

GP is cool

What did we know about Starcraft before?

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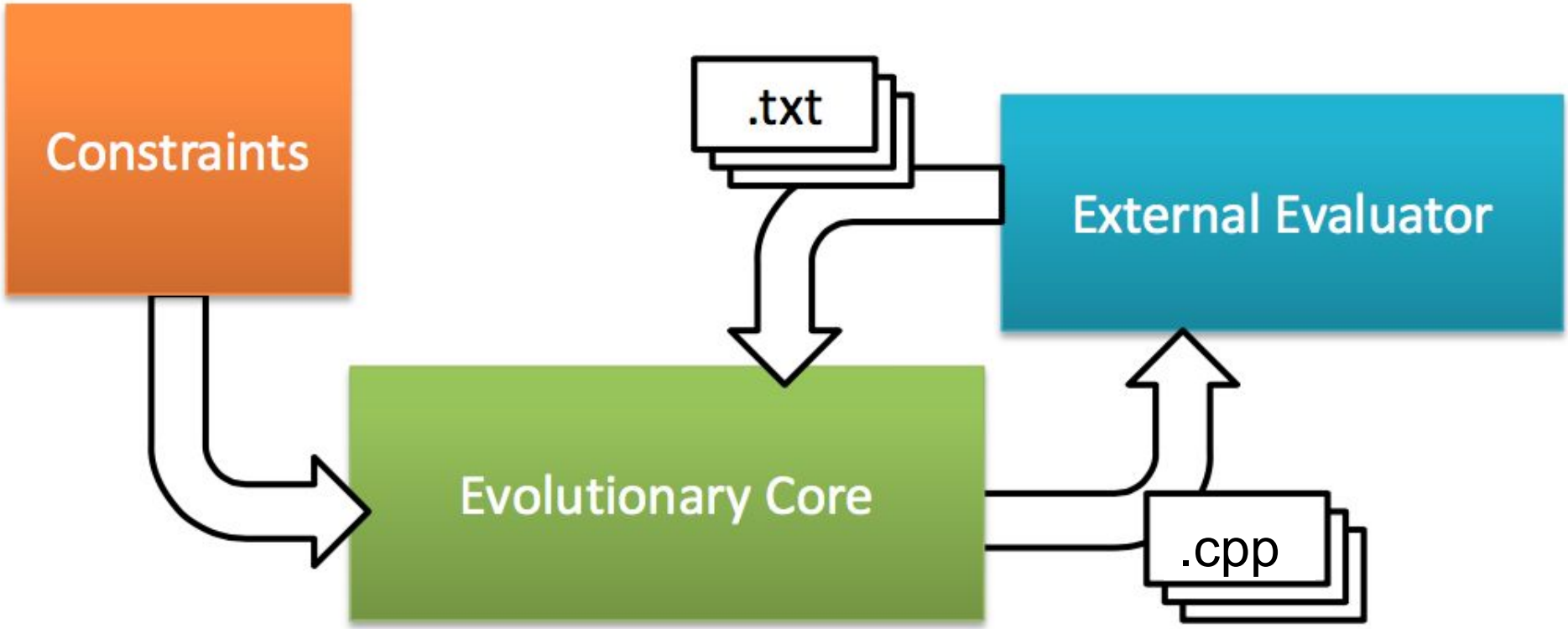
Nothing

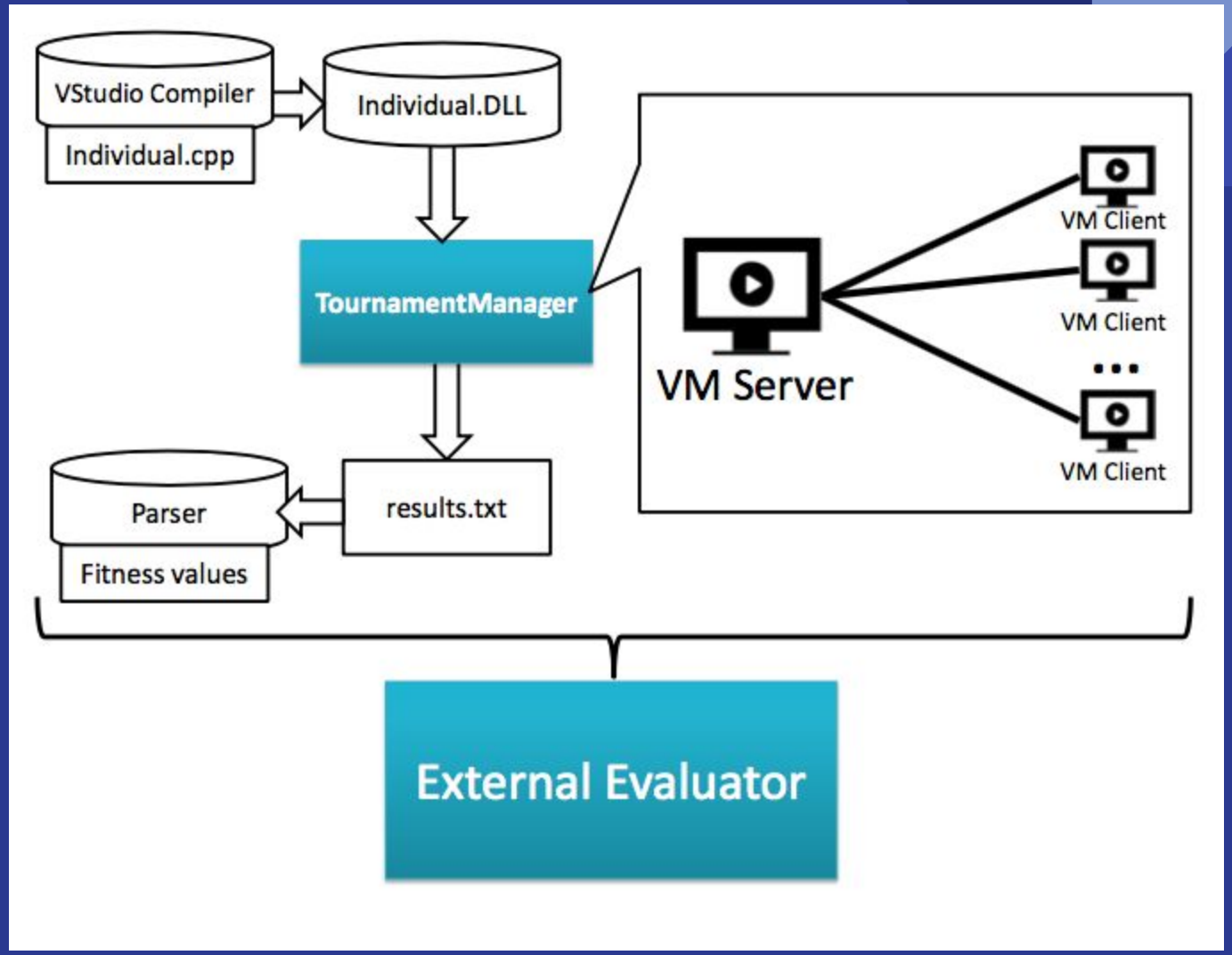
Well, Alberto played half-campaign in the 2000s

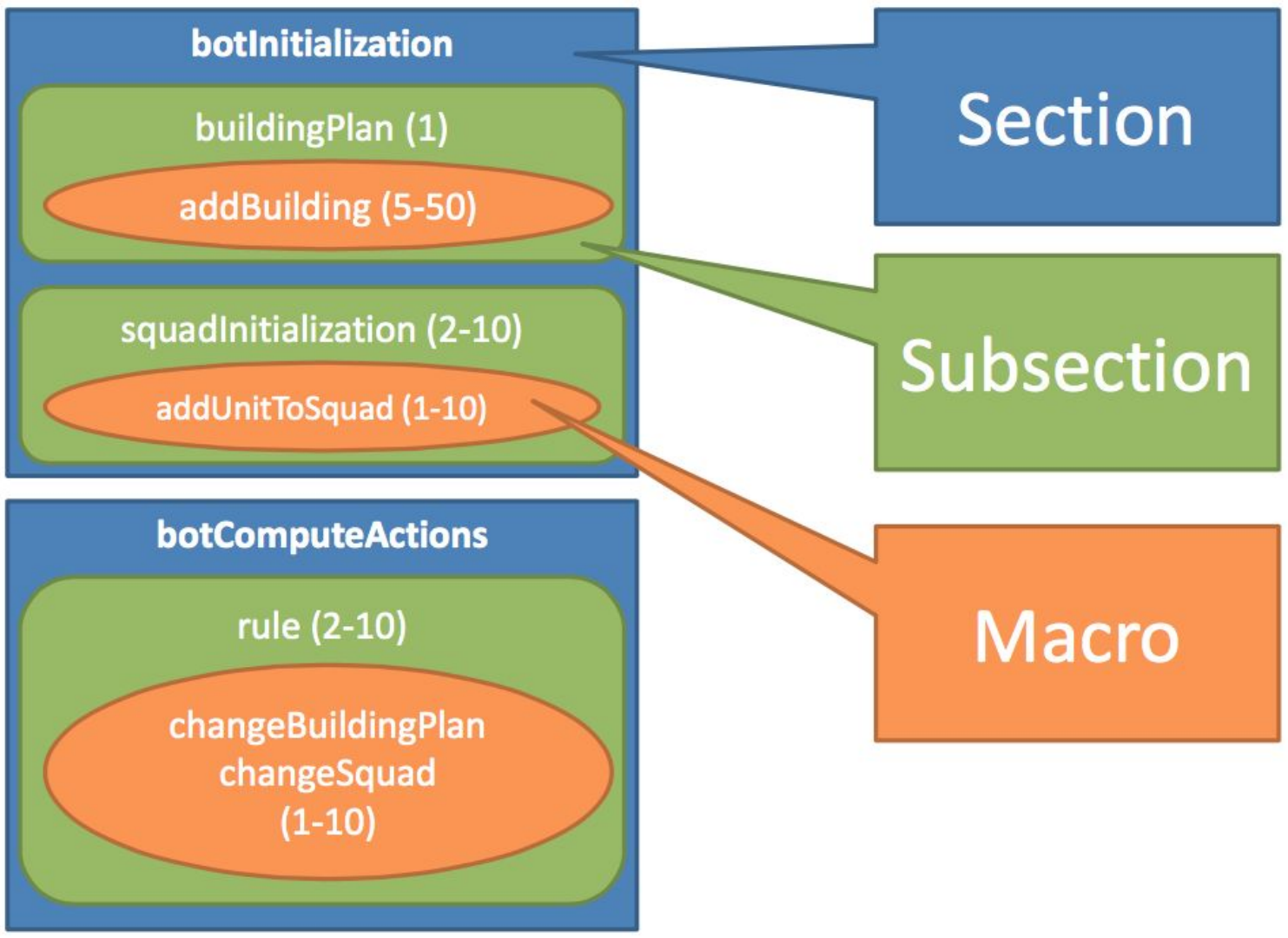
Then again, why StarCraft?

It’s the testbed in RTS AI research

And what did we do?


Constraints
.txt
External Evaluator
Evolutionary Core
.cpp


VStudio Compiler
Individual.cpp
Individual.DLL
TournamentManager
VM Server
VM Client
VM Client
VM Client
Parser
Fitness values
results.txt
External Evaluator


botInitialization
buildingPlan (1)
addBuilding (5-50)
squadInitialization (2-10)
addUnitToSquad (1-10)
botComputeActions
rule (2-10)
changeBuildingPlan
changeSquad
(1-10)
Section
Subsection
Macro

What does our generated code do?

We don’t know

Section

Subsection

Macro

Subsection

Macros

```
void ZergEvolvedStrategy::computeActions()
{
        computeActionsBase();

        noWorkers = AgentManager::getInstance()->countNoBases() * 6 +
        AgentManager::getInstance()->countNoUnits(UnitTypes::Zerg_Extractor) * 3;

        int cSupply = Broodwar->self()->supplyUsed() / 2;
        int min = Broodwar->self()->minerals();
        int gas = Broodwar->self()->gas();

        // due to the evolution process, stage can be lower than 0 or bigger than 10
        // for this reason, here we assure that the variable is within the thresholds
        if( stage < 0 ) stage = 0;
        if( stage > 10 ) stage = 10;

        // start of a rule
        if( stage == 6 || AgentManager::getInstance()->countNoFinishedUnits(UnitTypes::Zerg_Nydus_Canal) > 0
                || ! min > 476 && ! gas > 432 && ! cSupply > 805
                || ! Broodwar->enemy()->getRace().getID() == Races::Protoss.getID() )
        {
                buildplan.push_back(BuildplanEntry( TechTypes::Ensnare, 14 ));
                stage += 1;
        }
        // end of a rule

        // start of a rule
        if( stage == 4 || AgentManager::getInstance()->countNoFinishedUnits(UnitTypes::Zerg_Evolution_Chamber) > 0
                && ! min > 752 && gas > 69 || ! cSupply > 493
                || Broodwar->enemy()->getRace().getID() == Races::Zerg.getID() )
        {
                buildplan.push_back(BuildplanEntry( UpgradeTypes::Zerg_Melee_Attacks, 6 ));
                if( squads.size() > 8 )
                        if( squads[8]->maxSize() < SQUAD_LIMIT ) squads[8]->addSetup(UnitTypes::Zerg_Scourge, 1);
                                buildplan.push_back(BuildplanEntry( UpgradeTypes::Zerg_Missile_Attacks, 20 ));
                /*REST OF ACTIONS*/
                buildplan.push_back(BuildplanEntry( UnitTypes::Zerg_Queens_Nest, 10 ));
                if( squads.size() > 8 )
                        if( squads[8]->maxSize() < SQUAD_LIMIT ) squads[8]->addSetup(UnitTypes::Zerg_Queen, 1);
                if( squads.size() > 5 )
                        if( squads[5]->maxSize() < SQUAD_LIMIT ) squads[5]->addSetup(UnitTypes::Zerg_Zergling, 1);
                if( squads.size() > 1 ) squads[1]->setMorphsTo(UnitTypes::Zerg_Lurker);
                stage += 0;
        }
        // end of a rule

        /*REST OF RULES*/
}
```

Why is it “Human Competitive”?

It cannot win vs. humans

Well, actually no AI can beat humans in Starcraft (yet)

However...

It can beat several human-made techniques

And, it can beat the human-made bot used as baseline

And, thanks to this work...

We created an international group focused on Computational Intelligence in Games

(see our awesome paper on Hearthstone in the CIG conference!)

Thanks!
WOULD YOU LIKE TO KNOW MORE?